JULY 5, 1945

American Machinist

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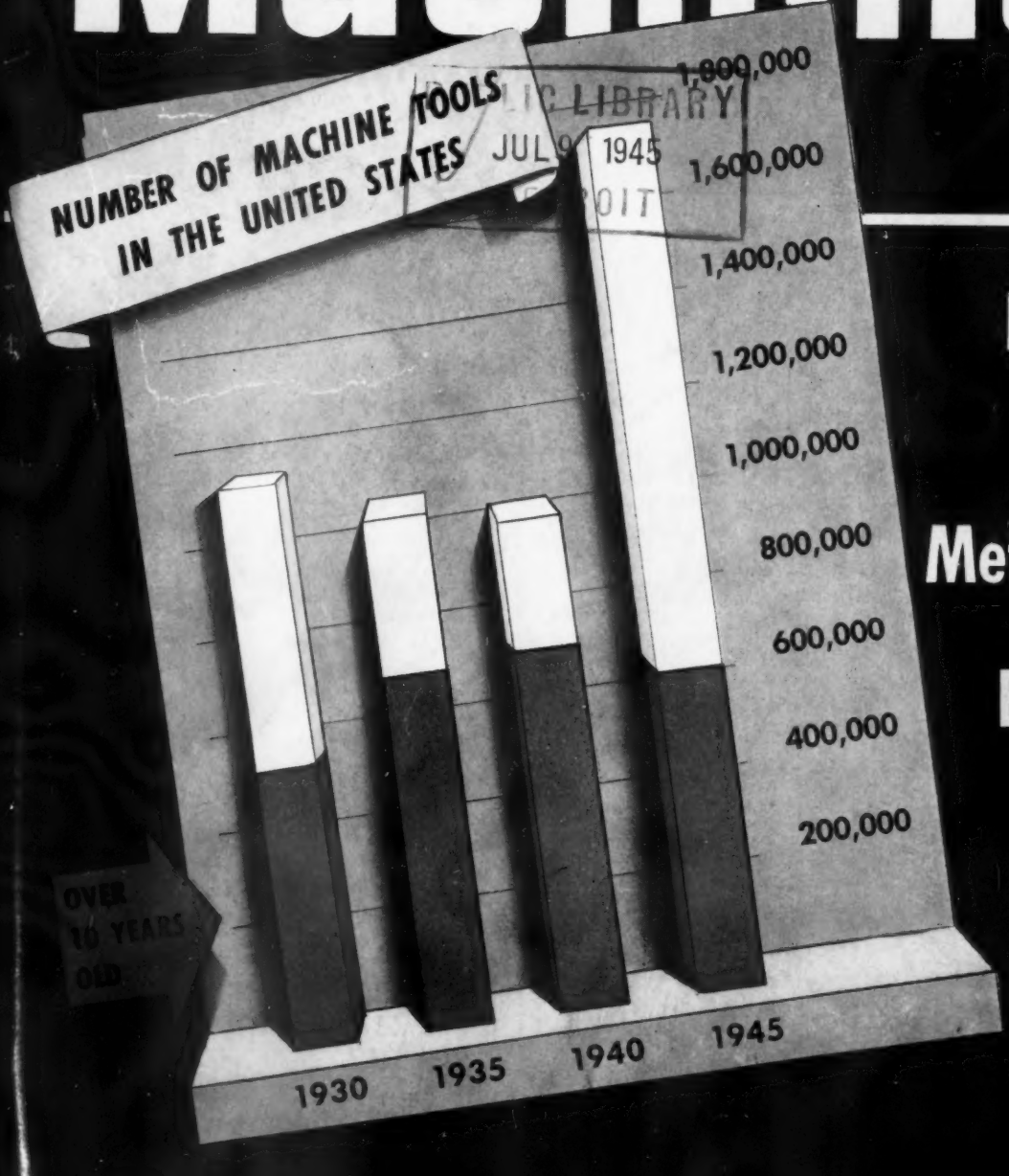

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Inventory of Metal-Working Equipment

SIZE-MATIC DOES HIS THINKING FOR HIM!

R v. 894 July-Aug. 1945

The Heald Method of Automatic Sizing Means Faster Production . . . Fewer Rejects in Internal Grinding

Add up the time your operators spend with plugs, gages, feelers, calipers—or any other manual method of checking size in internal grinding operations—and you have the best reason in the world for finding out now about automatic sizing—*the Heald way*. With a Heald Size-Matic Internal on the job, for example, your operators *don't have to think* about when your work is to size. The Heald Size-Matic knows!

An "automatic brain" is built into your Size-Matic. It assumes entire responsibility for sizing, by predetermining the exact number of wheel passes required to bring the work to the desired hole size. Sizing is done without any connection with the work. It makes no difference whether you're grinding straight or tapered holes; with or without keyways; open-end or blind; large or small. A Heald Size-Matic means that all your men do is load the work and throw the starting lever to give you faster work and better work—automatically.

MISCELLANEOUS RUNS OR VOLUME PRODUCTION

Only the simplest adjustments are required on a Heald Size-Matic to make it suitable for large production runs, or a wide variety of assorted jobs. In either type of work, tolerances are easily held within ten-thousandths. Exact uniformity is assured.

Heald has proved this automatic principle through 20 years of successful use. But a Size-Matic is only one way of securing the advantages of Heald experience with automatic operation, to gain faster, better lower cost production. Why not ask a Heald Engineer to come in and lay some interesting and profit-making facts before you?

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

Tech

More Precision · Less Cost **HEALD**

INTERNAL AND SURFACE GRINDING MACHINES · BORE-MATIC PRECISION FINISHING MACHINES

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American Machinist *Chips*

The 1945 Inventory of Metal-Working Equipment, featured in this issue, brings you the latest and most authentic picture of our manufacturing facilities.

Particularly interesting is the revelation that 38% of all metal-working equipment installed in American industry is over 10 years old. Discussion of this and many other significant facts will make absorbing reading for all shop men.

As in former years, the Inventory is being reprinted—complete with the large table of figures detailing the 2,799,532 units of shop equipment identified.

These reprints are priced at $1.00 each and are available to readers who may wish one or more extra copies of this study.

When you have had a chance to go over the 1945 Inventory, we would appreciate receiving your comments.

AMERICAN MACHINIST
330 West 42d St., New York 18, N. Y.

Please send me, at $1.00 each, ( ) copies of the reprint of your 1945 Inventory of Metal-Working Equipment.

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IST

BEVEL GEAR DRIVES — TO *Victory*

ombsights depend on fine-pitch bevel gears like these for their accuracy.

icial U.S. Air Force Photo, *Signal Corps - International*

PRECISION BOMBING BY MECHANICAL BRAINS

Modern U.S. bombsights are responsible for the deadly accuracy of our Air Forces' high altitude bombing which is hastening the day of victory.

Once set exactly on the target by the bombardier, these bombsights perform virtually as a mechanical brain, automatically taking into account all variables and capable of dropping a bomb from 20,000 feet into a "pickle barrel."

BEVEL GEARS CONTRIBUTE REQUIRED ACCURACY

When this mechanical brain is set on the target and takes control of the plane, moments are tense and success of the mission depends upon its perfect functioning. Absolute synchronization and smoothness of motion of all parts is essential. It is here the accuracy of the gears in the mechanism counts.

Super-precision bevel gears, designed by Gleason engineers and manufactured in accordance with improved Gleason production techniques, have successfully met every such action test.

These bevels are cut to extremely fine tolerances for pitch line concentricity and tooth spacing. The method of tooth generation on latest Gleasons gives the accuracy of profile and high degree of surface finish necessary for the smooth operation of the unit.

Quick assembly with zero backlash is possible by virtue of the axial adjustability of bevels. This advantage is of great value, especially in the case of differential applications in the mechanism.

CUT ON GLEASON MACHINES

Mass production of these super-precision bevel gears is accomplished on the Gleason 3″ Generators, aided by essential Gleason auxiliaries.

Bevel gears are important parts of many other control instruments for peace as well as war. Gleason engineers will be glad to help you design bevels for these applications and select machines for their manufacture.

GLEASON

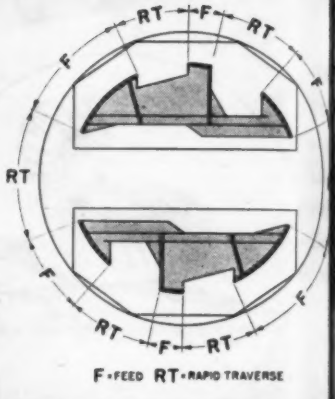
GLEASON WORKS

Builders of Bevel Gear Machinery for Eighty Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N.Y., U.S.A.

Custom Built by Cincinnati

CINCINNATI



F • FEED RT • RAPID TRAVERSE

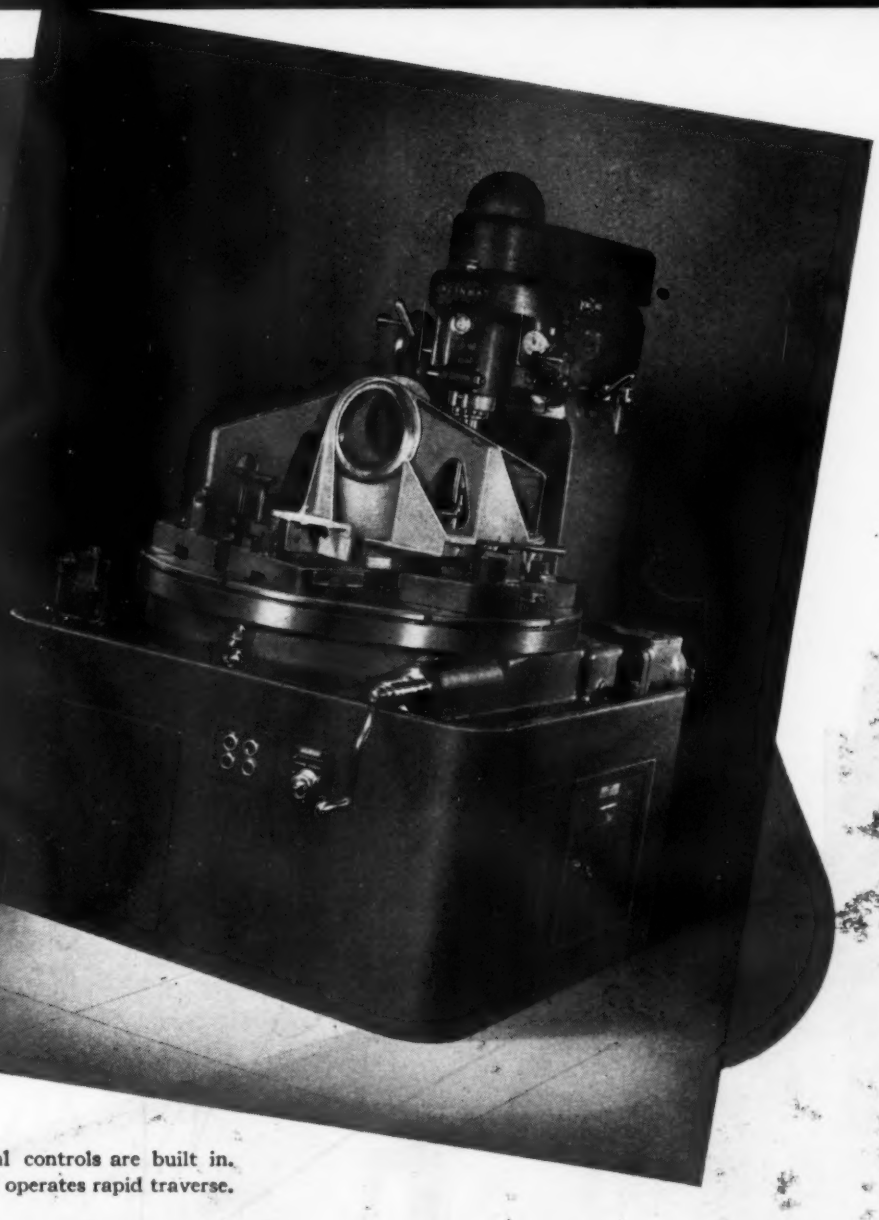
Illustrated at left is the
up from the rear. Notice
long reach of the cutter
mill the three pads
each part.

KEEP YOUR PAYROLL ALLOTMENT FOR **WAR BONDS** UP TO **15%** OR MORE

THE CINCINNATI

MILLING MACHIN

TO CIRCULAR MILL LARGE PART REQUIRING A LONG REACH



The sketch at the left shows a top view of the two parts in position for milling. Heavy lines indicate surfaces to be milled.

Front view of the machine. Electrical controls are built in. Lever at the left-hand corner of the bed operates rapid traverse.

This equipment shows what is being done by Cincinnati Application Engineers in designing semi-special machines to handle special milling jobs that present difficult problems. The part is large and requires considerable table surface for clamping, yet it is light in weight and the cuts are light. The machine constructed to handle the operation—milling three pads—consists primarily of a rectangular base supporting a 42" diameter circular table and a standard CINCINNATI No. O-8 Vertical Milling Head mounted on a column of sufficient height to clear the work. ¶ The fixtures accommodate two parts, right- and left-hand. As one part is milled, another is loaded. When milling is completed on one pad, a flip of a conveniently located lever rapid traverses table to the next pad. Virtually no time is lost cutting air. ¶ Talk over your milling operations with our engineers. They will be glad to give you the benefit of their many years' experience.

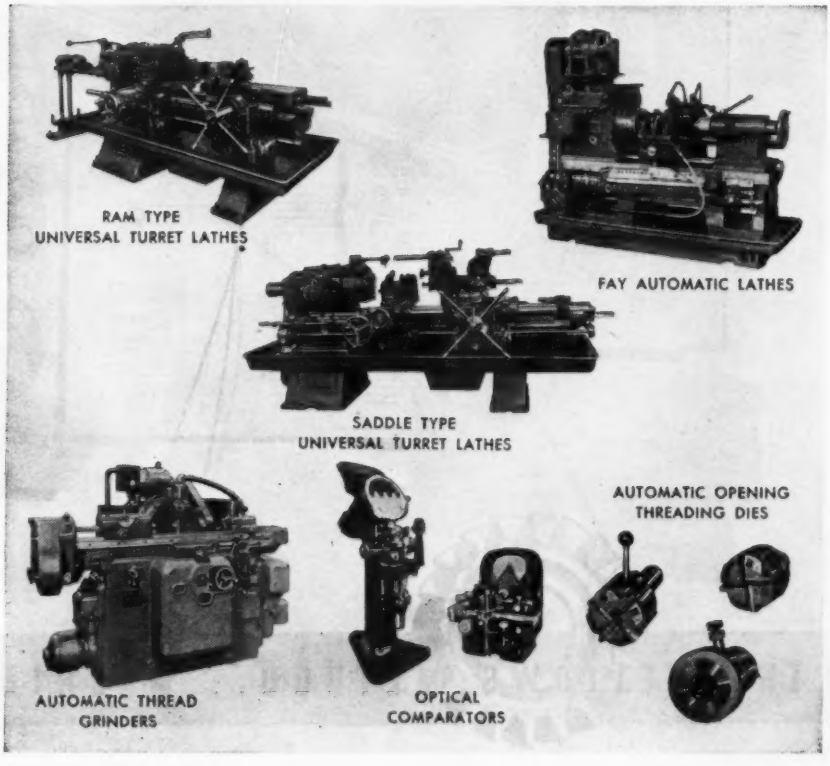
MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

COSTS WILL

L MAKE THE DIFFERENCE

Manufacturers must use the most efficient machine tools available, to remain in business and maintain *full employment.* Today carbide cutting tools make possible increases of from 200 to 500 per cent in the speed of metal turning—but only when used with machines which can transmit the horsepower and have the rigidity to take full advantage of these tools. Scrap your old machines. Purchase War Surplus machines or new machines. Ask for one of our engineers to assist you in making the most profitable investment. Or, send for our book, "Welcome to You and Your Problems".



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MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

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The Art of Generating with a Reciprocating Tool
FELLOWS
The Fellows Gear Shaper Company
Springfield, Vermont, U.S.A.
Generating a Fast Gear-type Clutch
Generating of Multiple Round Holes of Different Diameters, Center Radii, and Angular Spacing

THE FELLOWS METHOD... MACHINES AND TOOLS FOR ALL

WANDBOOK

n the Production of CONVENTIONAL GEARS
nd IRREGULAR SHAPES

for { • MANUFACTURERS
• DESIGNERS
• ENGINEERS

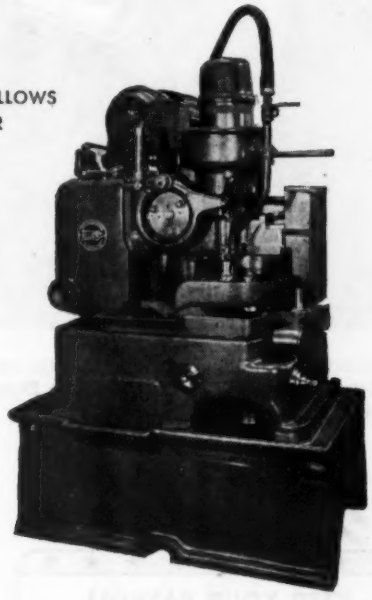
Based on the cumulative experience of close to a half century in the production of precision gear manufacturing equipment, it covers the principle of the generating process with many interesting and practical applications.

Profusely illustrated with both photographs and diagrams, the 48-pages of this highly informative handbook reveal many important facts relative to:

1. The Principle of "Conjugate" Generating.
2. Applications of "Offset-Conjugate" Generating.
3. Applications of "Interrupted-Conjugate" Generating.
4. The Principle of "Describing" Generating.
5. Reciprocating Tool Applications and Attachments.

Manufacturers, designers and engineers will find in this book highly useful and interesting data on means of accomplishing greater economies and accuracy through the application of the Fellows Gear Shaper.

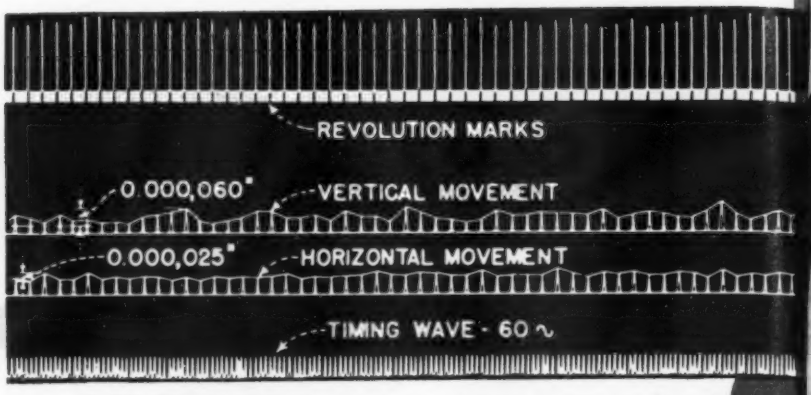
Your copy of "The Art of Generating With a Reciprocating Tool" will be mailed promptly on receipt of a request on your company's letterhead. The Fellows Gear Shaper Company, Springfield, Vt., or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago.



7 A—TYPE FELLOWS GEAR SHAPER

Fellows

FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR



CINCINNATI

ORDINARY BEARINGS. *Tips of wave peaks indicate the spindle position once each revolution. The irregularity in position of the wave tips indicates a slight fluttering of the spindle axis.*

FILMATIC

QUICK SE

Saves T

Improves C

Grinding a milling machine spindle on a **CINCINNATI** 10" Plain Hydraulic Grinder with **FILMATIC** Spindle Bearings. Catalog G-490-1 contains complete specifications.

KEEP YOUR PAYROLL ALLOTMENT FOR WAR BONDS UP TO 15% OR MORE

CINCINNATI G

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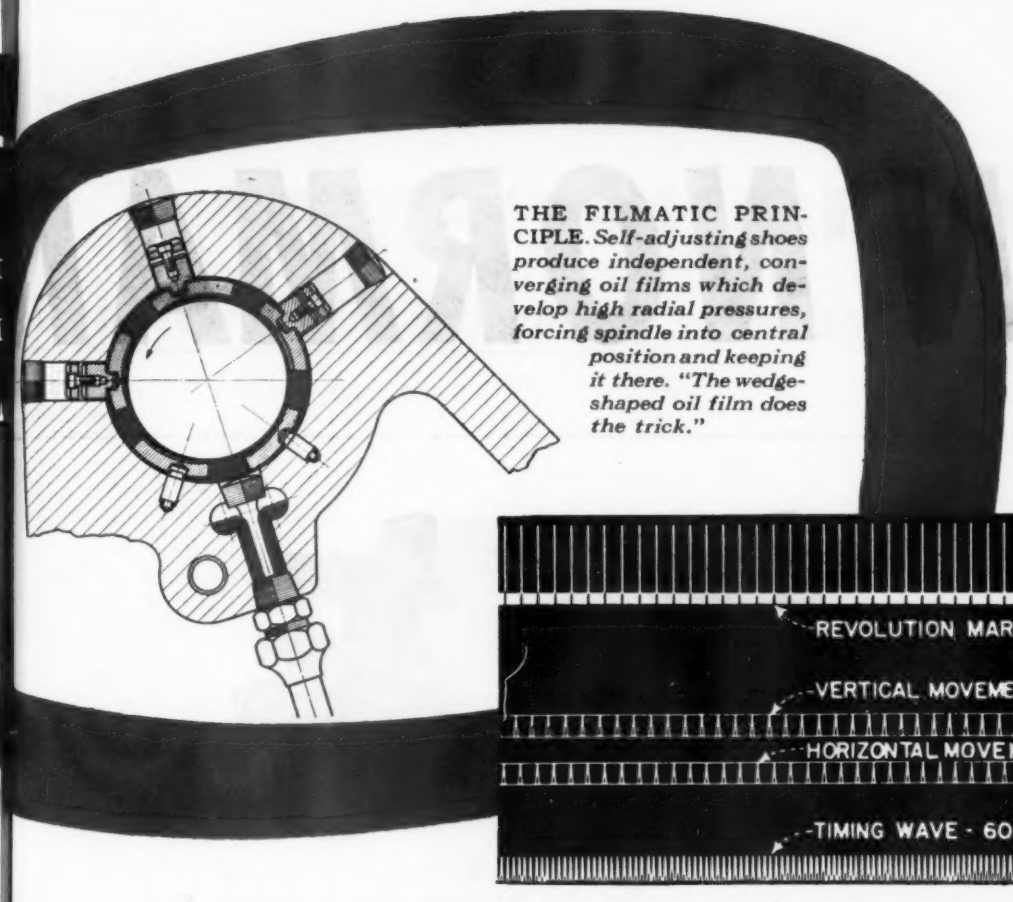
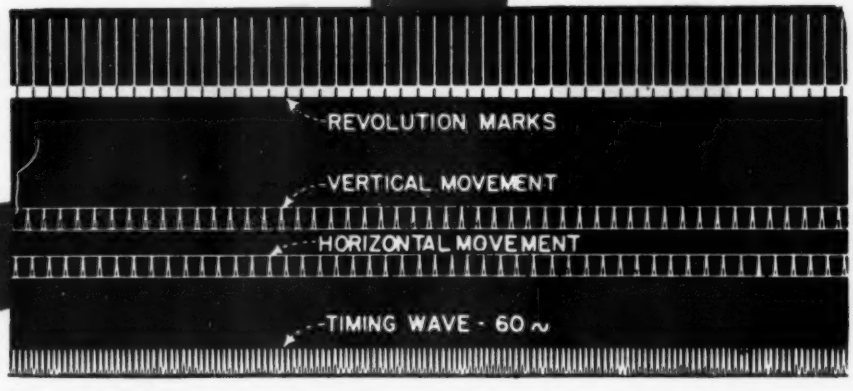
CENTER TYPE GRINDING MACHINES

CEN



THE FILMATIC PRINCIPLE. *Self-adjusting shoes produce independent, converging oil films which develop high radial pressures, forcing spindle into central position and keeping it there. "The wedge-shaped oil film does the trick."*



FILMATIC BEARINGS. *No discernible spindle flutter. The even alignment of the wave tips in this oscillogram indicates a true running spindle.*

K SPARK-OUT

Time Accuracy

Take a good look at the two oscillograms shown above. Notice the spindle flutter when ordinary bearings are used as compared with the complete absence of flutter with **FILMATIC** Bearings. The wedge-shaped oil films build up exceptionally high pressure to hydraulically maintain dead center rotation. This **FILMATIC** Bearing characteristic assures quick spark-out and consequently more rapid attainment of accurate dimensions. ¶That CINCINNATI Grinding Machines, all equipped with **FILMATIC** Bearings, merit serious consideration is evidenced by the fact that over a period of several years, they never have had any down time charged against them because of grinding wheel spindle bearing failure. This alone would be reason enough for you to choose CINCINNATI's, but in addition to the long life of these bearings, and the quick spark-out feature, there are many other advantages you're going to like. The entire story is contained in booklet G-446. A copy will be sent on request. Sweet's Catalog File for Mechanical Industries gives a brief description of CINCINNATI Centertype and Centerless Grinding Machines and Centerless Lapping Machines.

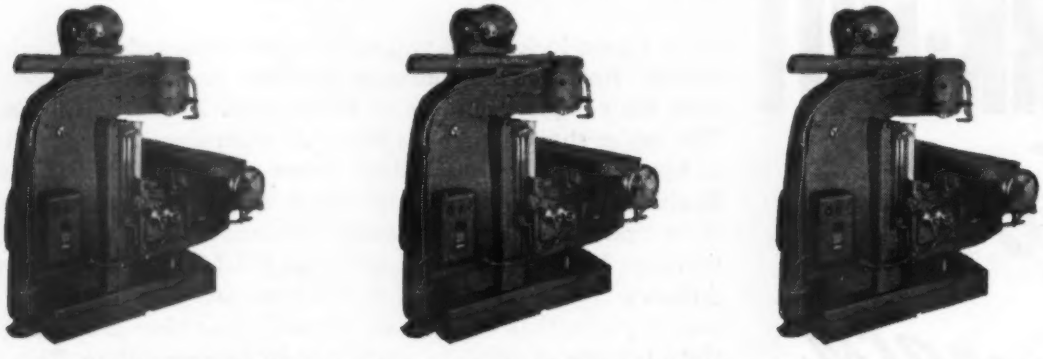
GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

VAN NORMAN

HORIZONTAL MILLING—Adjusting the head to horizontal position, the operator is ready for any horizontal milling operation. Should the same work piece call for angular or vertical milling, the operator swivels the cutterhead into the desired position and takes the cut, usually without changing the work set-up.



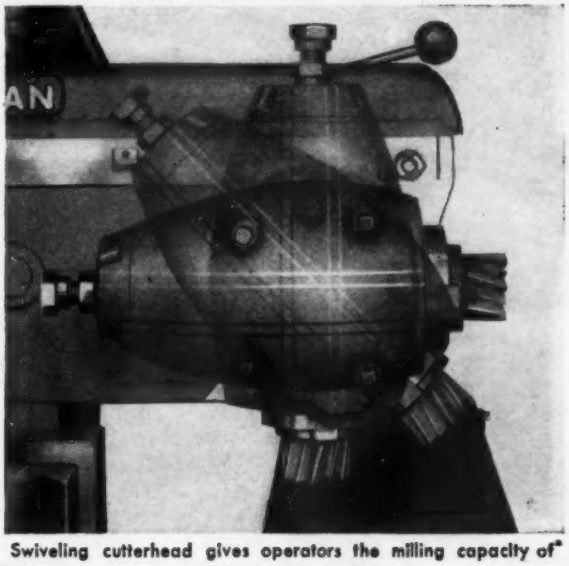
VERTICAL MILLING—Whether it's the same day or next—and the milling requirements call for the use of vertical millers—the operators of Van Norman Ram-Type Millers swivel and lock the cutterheads in the vertical position and proceed with the work. Thus the machines are in operation constantly with subsequent savings in cost.

ANGULAR MILLING—If there's an angular milling job to perform, the operator swivels and locks the cutterhead in the required position and he is ready for milling operation.

All vertical, all horizontal, all angular—or some vertical, others horizontal, etc., that's what Van Norman Ram-Type Millers give you . . . the work range of several single purpose machines *in each miller.*

RAM-TYPE MILLERS

Meet Every Milling Requirement . . . Horizontal, Vertical, Angular



Swiveling cutterhead gives operators the milling capacity of several machines in ONE.

The versatility of Van Norman Ram-Type Millers enables you to plan your work so that idle machine time can be practically eliminated—operators can be kept busy daily.

For instance, you have several Van Norman Ram-Type Millers. Each of these machines gives you the working capacity of a horizontal, angular and vertical miller. This means that no matter what type of work you have from day to day, each Van Norman Ram-Type Miller can do the job. The result is no waiting for specific machines . . . no production delays . . . increased profits from full utilization of the operators and millers. And another important advantage is that Van Norman Millers will meet post-war requirements for tool room and general purpose milling.

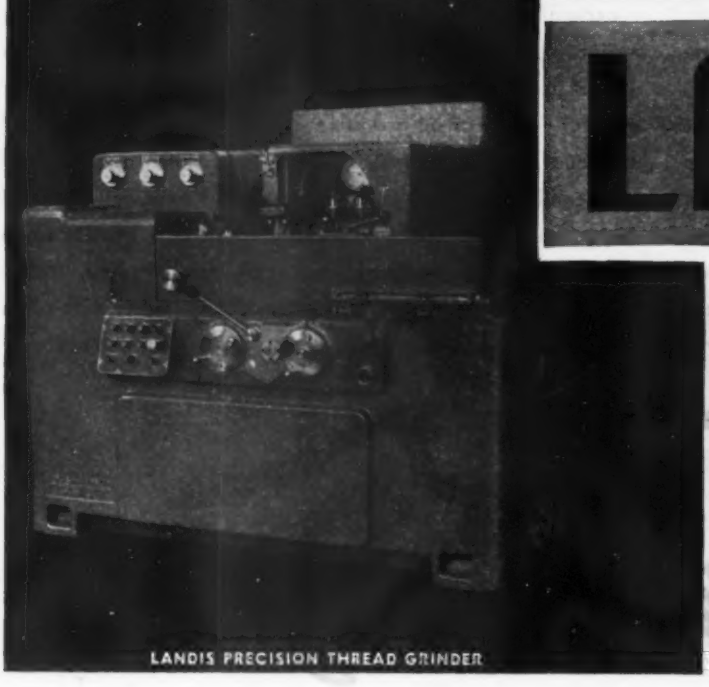
The adjustable cutterhead saves money and insures accurate work because most jobs can be carried through to completion without changing the work set-up. Add to this such features as movable ram, front and rear directional control of all power feeds, front and rear control of manual feeds, heavy-duty column, knee and saddle assemblies, heavy-duty arbor support, conveniently located speed selector, and you'll readily see how Van Norman Ram-Type Millers insure accuracy, save money, speed milling operations and reduce rejects. Available with plain or swiveling table. Write for complete information today.

VAN NORMAN COMPANY

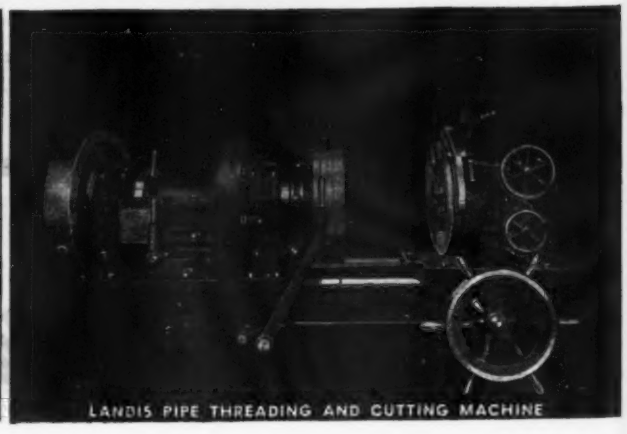
Springfield 7, Massachusetts

"It pays to Van Normanize"

LANDIS



LANDIS PRECISION THREAD GRINDER



LANDIS PIPE THREADING AND CUTTING MACHINE

IST

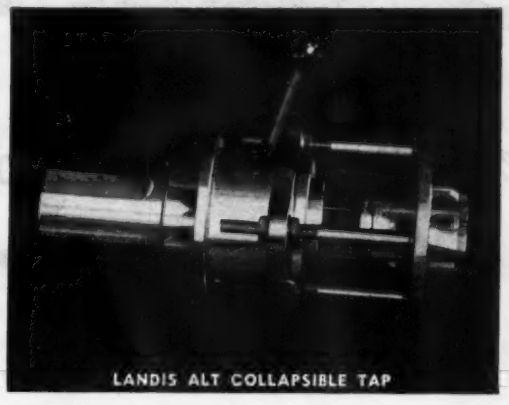
LANDIS *Equipment*

THREAD CUTTING-GRINDING-ROLLING

THE LANDIS CHASER

For war production or peace production, your threading requirements will be handled accurately, efficiently and economically with Landis Threading Equipment—known and accepted as the world's finest for over forty years. Submit your threading problem to Landis engineers.

THE LANDMATIC HEAD



LANDIS ALT COLLAPSIBLE TAP

THE LANCO HEAD

MACHINE CO. WAYNESBORO PENNA. U.S.A.

LANDMACO THREADING MACHINE

LANDIS 2½" THREADING MACHINE

AUTOMATIC FORMING & THREADING MACHINE

Turning idle time into work ON INTERRUPTED CUTS

Interrupted cuts can't be eliminated, of course. But their cutting cycle can be *shortened*.

Putting this idle time to work *upped production 30%* for one manufacturer. The operation called for milling dozens of cooling fins on a radial aircraft engine cylinder head. A special automatic fin-milling machine rotated the workpiece at constant speed. But because of the irregular shapes and varying depths of the fins, the load on the cutter was extremely uneven. At certain points in the cycle, the cutter actually was out of contact with the work altogether.

Westinghouse engineers recommended a simple solution—the use of Mot-O-Trol—an electronic adjustable speed drive with accurate load control characteristics. With it, the cutter was kept operating at rated capacity, by speeding up the rotation of the workpiece over the light-cut sections. Here's another case where Westinghouse was able to apply a proved electrical device to meet a specialized machining requirement —a simple electrical solution to a complicated mechanical problem.

For faster, more efficient, *more economical* metalworking methods, come to Westinghouse. You'll get prompt, *practical* help. Call your nearest Westinghouse representative—or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

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Westinghouse

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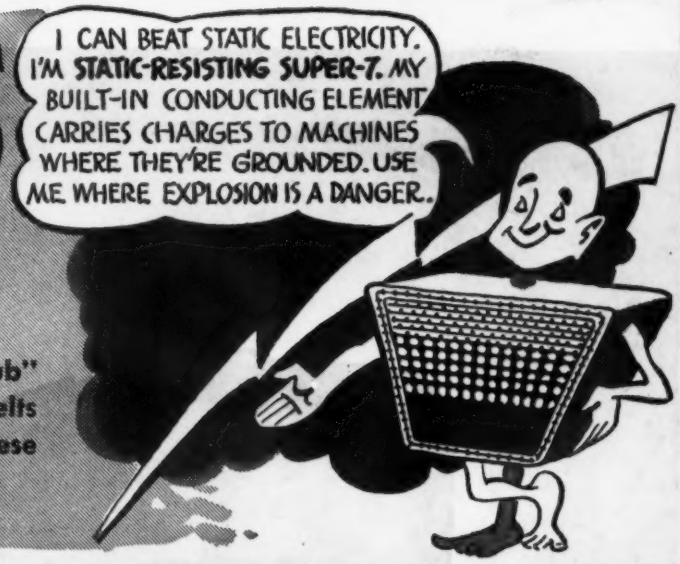
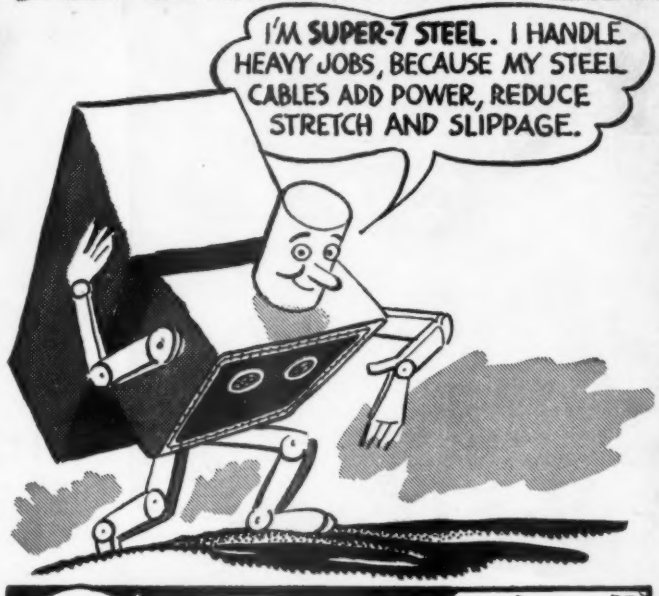
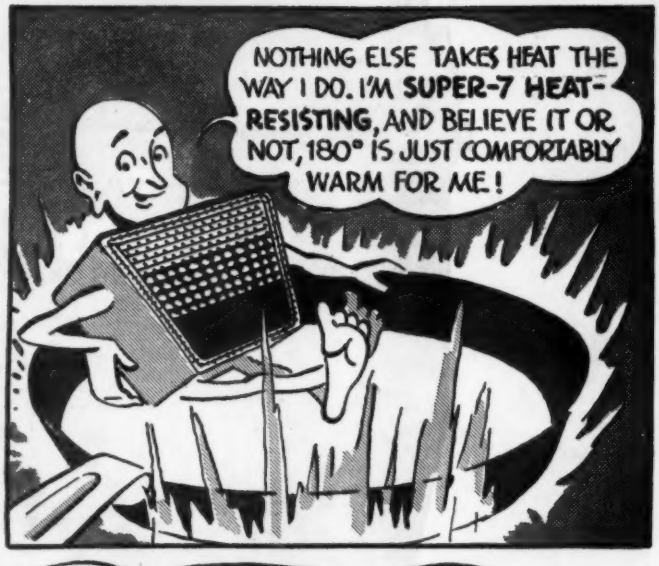
THE MACHINE IN MACHINE TOOLS

TALL TALES ...but TRUE!

Their exploits may sound like a "Liars Club" meeting . . . but the great new Texrope V-Belts really do solve each and every one of these various drive problems.


I CAN BEAT STATIC ELECTRICITY. I'M STATIC-RESISTING SUPER-7. MY BUILT-IN CONDUCTING ELEMENT CARRIES CHARGES TO MACHINES WHERE THEY'RE GROUNDED. USE ME WHERE EXPLOSION IS A DANGER.





IT PAYS TO MAKE ALLIS-CHALMERS YOUR V-BELT DRIVE HEADQUARTERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

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Regulating wheel and grinding wheel are each a self-contained, enclosed unit mounted on separate bases, individually adjustable.

Clean, modern lines at sides and back too. Hinged covers and doors permit easy access to all operating parts for inspection and maintenance.

LANDIS TOOL

Precision Grinders

LANDIS TOOL COMPANY

LANDIS NO. 12 CENTERLESS GRINDER

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What Good Appearance Means in Performance

"Why," you ask, "talk about the best looking centerless grinder when performance is what counts?"

One look at the clean, compact design and smooth lines tells you that the Landis Tool No. 12 Centerless is new and modern. The design represents an entirely fresh concept of centerless grinding which includes all the latest features for maximum operator output plus closest tolerances.

The grinding wheel and the regulating wheel are designed for the first time as individual units mounted on separate bases. This permits enclosure of each for safety and best appearance. The weight of driving motors mounted directly on the bases gives a wheel rigidity which results in better, smoother finishes.

The separate wheel bases simplify the adjustment and control of both wheels by the operator. All grinding and dressing operations are hydraulically or electrically controlled, thereby eliminating cut and try. Furthermore, controls are conveniently grouped for speedy operation.

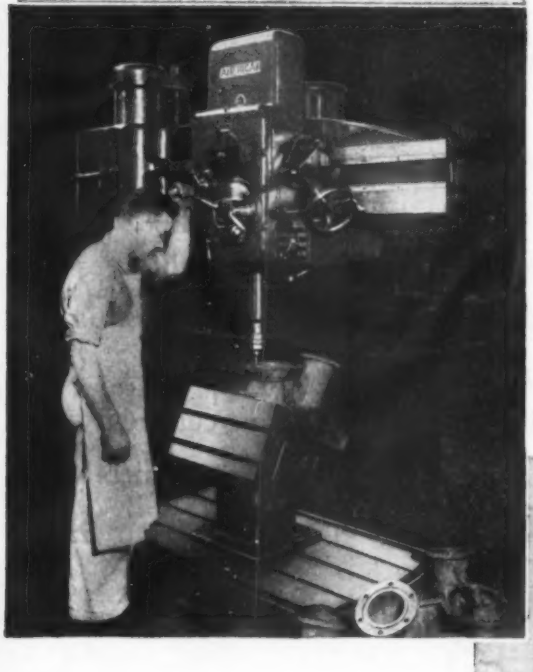
For full information on the many other modern design features, ask for Catalog T44

LANDIS TOOL Company

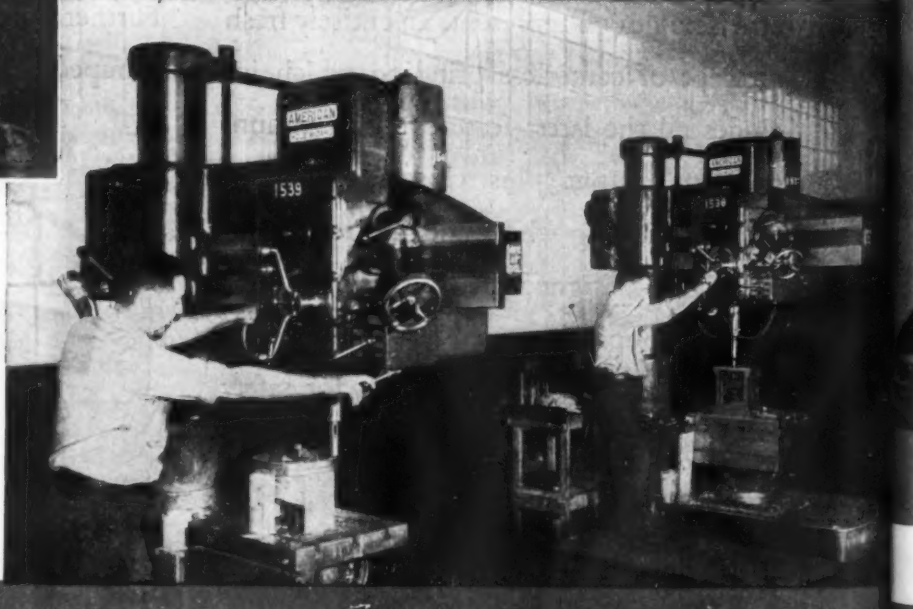
WAYNESBORO, PA.

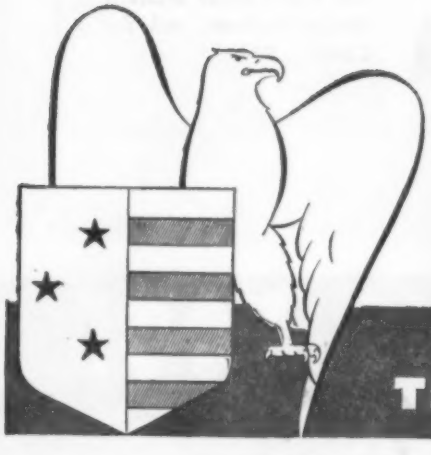
MARVELS . . .

COURTESY OF BELL AIRCRAFT CORP.



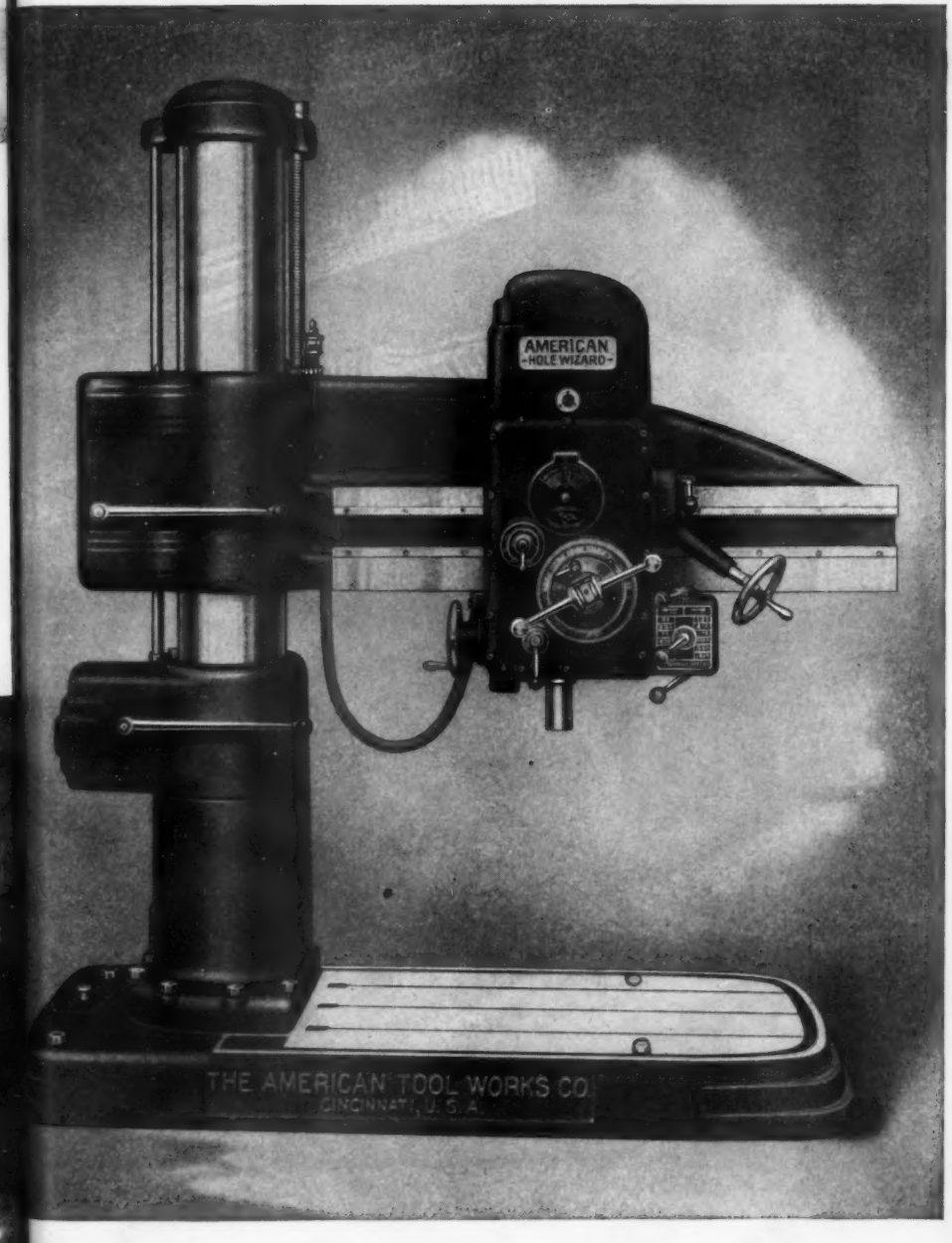
Increasing numbers of planes in the skies over our far-flung battle fronts testify to the success which American aircraft manufacturers are achieving. Helping them with all kinds of drilling, boring, facing and reaming jobs "AMERICAN" Hole Wizard Radials are proving themselves outstanding performers on the super-accurate jobs which aircraft production demands. American manufacturing skill plus "AMERICAN" Hole Wizards are a winning combination for all types of war production. Bulletin No. 310 gives all the facts. It is yours for the asking.





THE AMERICAN TOOL WORKS C

. of Speed and Maneuverability

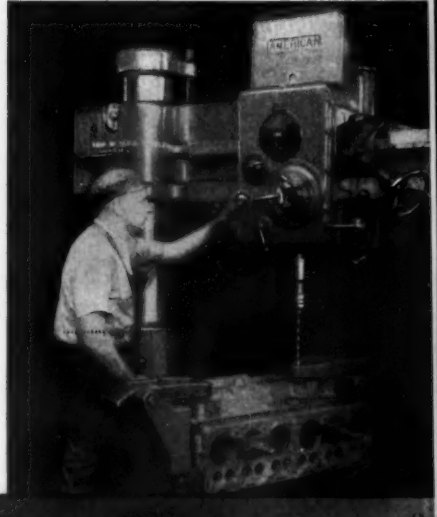


It's their convenience and ease of handling that have made them the choice of both operators and cost minded production men.

All control levers are conveniently placed and may be reached by the operator from his normal working position. The arm swings with practically no effort. The head is mounted on anti-friction rollers and feels as "light as a feather."

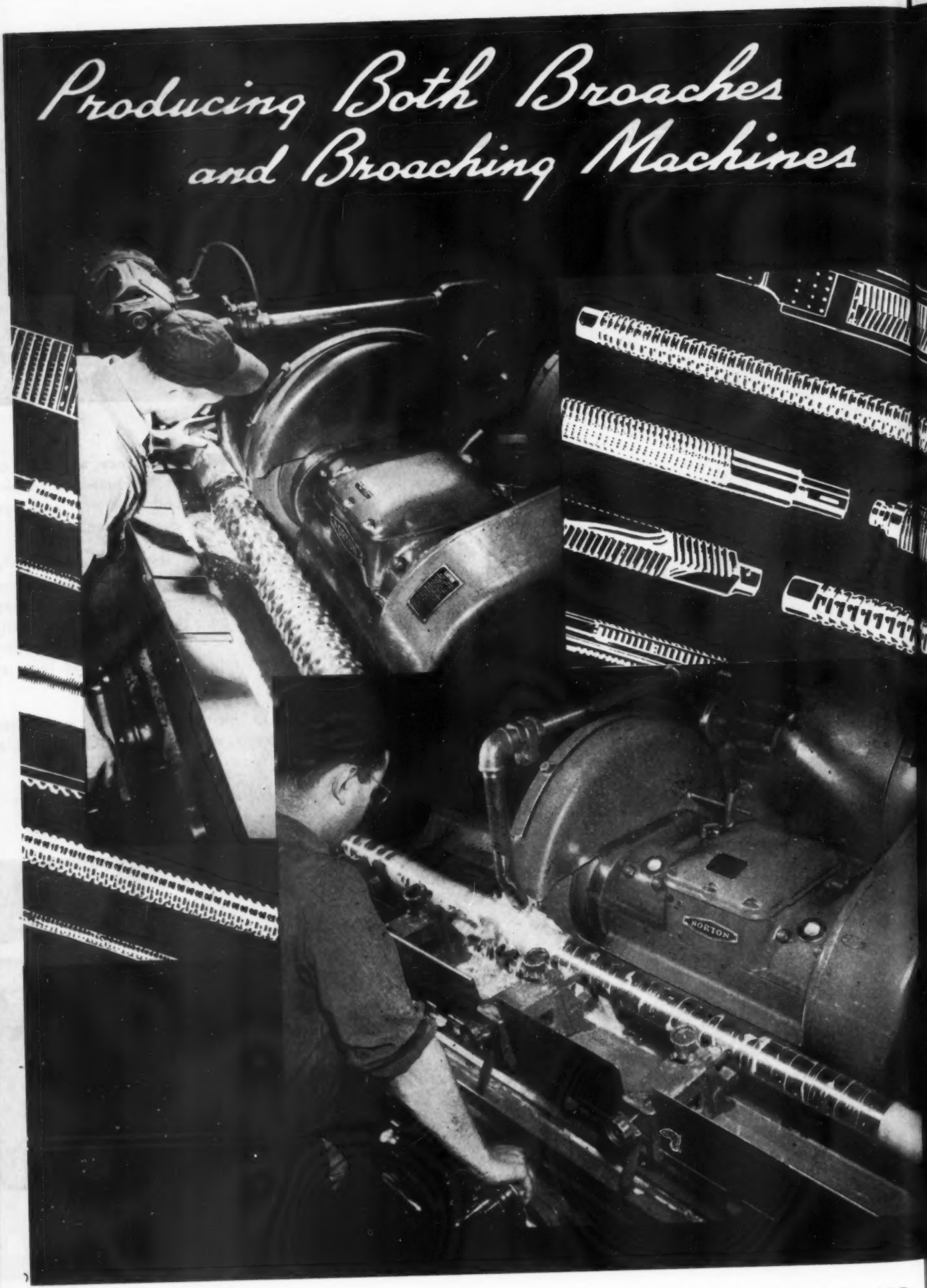
To increase production and lower costs select "AMERICAN" Hole Wizard Radials.

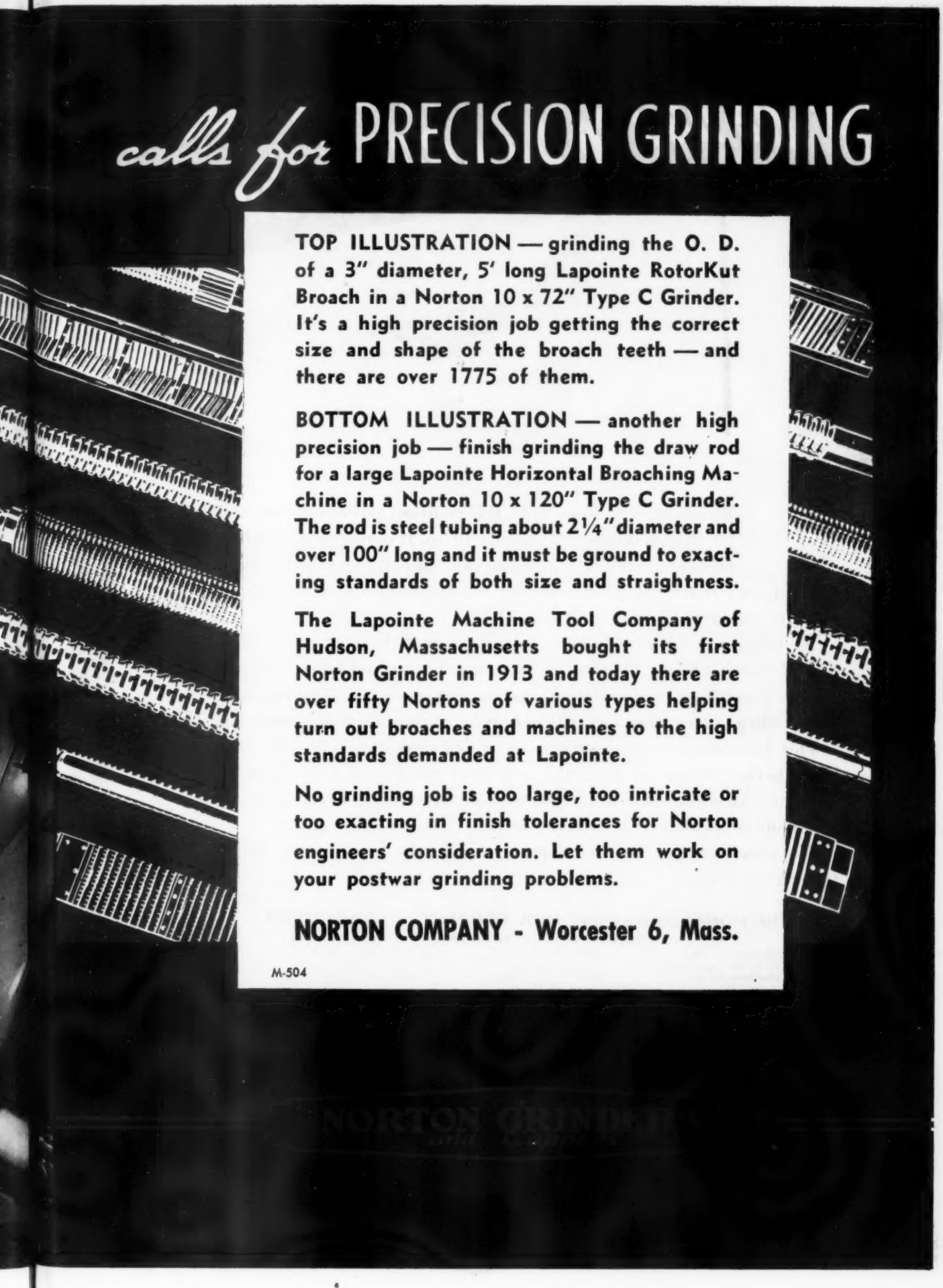
Bulletin No. 315 upon request.



Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

Producing Both Broaches and Broaching Machines





calls for PRECISION GRINDING

TOP ILLUSTRATION — grinding the O. D. of a 3" diameter, 5' long Lapointe RotorKut Broach in a Norton 10 x 72" Type C Grinder. It's a high precision job getting the correct size and shape of the broach teeth — and there are over 1775 of them.

BOTTOM ILLUSTRATION — another high precision job — finish grinding the draw rod for a large Lapointe Horizontal Broaching Machine in a Norton 10 x 120" Type C Grinder. The rod is steel tubing about 2¼" diameter and over 100" long and it must be ground to exacting standards of both size and straightness.

The Lapointe Machine Tool Company of Hudson, Massachusetts bought its first Norton Grinder in 1913 and today there are over fifty Nortons of various types helping turn out broaches and machines to the high standards demanded at Lapointe.

No grinding job is too large, too intricate or too exacting in finish tolerances for Norton engineers' consideration. Let them work on your postwar grinding problems.

NORTON COMPANY - Worcester 6, Mass.

M-504

We had to be GOOD to build this

Weighing only 40 pounds, this compact power take-off unit for British bombers transmits 40 hp. It demands the highest precision machining and assembly of parts processed almost to laboratory standards. Monarch is the only plant in America entrusted with its production

We've gained this skill in close tolerances over the years of building fine Monarch Lathes. Much of the turning, boring and facing of parts for this power unit is done on our own turning machines, demonstrating their ability to meet the most critical requirements of aircraft production.

This broadening experience gained by our operators will help them build better Monarchs from the improved designs of our engineers. Your new Monarchs will enable you to produce faster, more economically and more accurately than ever before.

See your nearest Monarch representative about present or future turning problems.

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

Representatives in Principal Cities

SAVE TIME, MONEY, MATERIALS WITH MONARCH TURNING MACHINES

New Monarch 10" x 20" Sensitive Precision Toolmaker's Lathe.

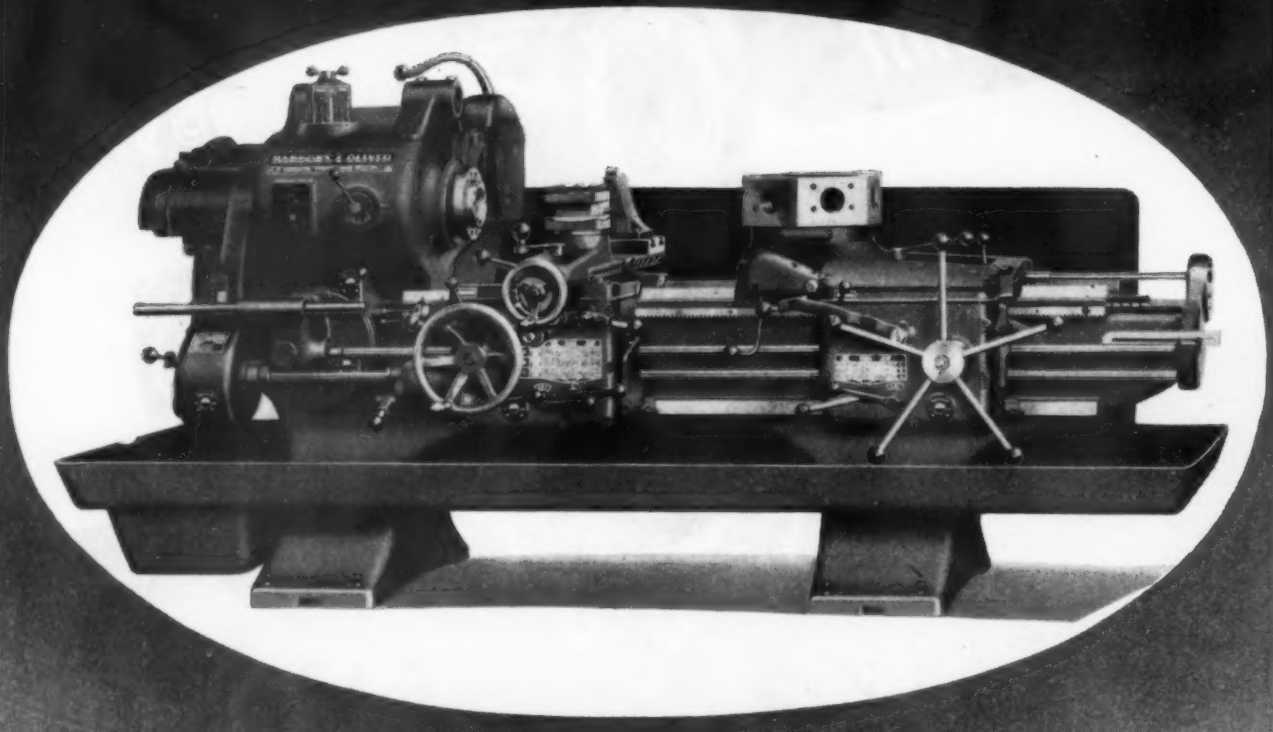
New Monarch Shapemaster Formturning Machine.

One of three types of Monarch's new 10" Hi-Speed Precision Turning Machines.

Improved Monarch Fully Automatic Magnamatic Turning Machine.

Aircraft Unit
Monarch Saves Time

No. 21 *Saddle Type* TURRET LATHE



High Standards

OF WORKMANSHIP AND PERFORMANCE

MAKE THIS BARDONS & OLIVER TURRET LATHE

AN OUTSTANDING INVESTMENT . . . .

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

CTW

A CHAIN IS AS STRONG AS ITS WEAKEST LINK

A MACHINE IS AS GOOD AS ITS CUTTING TOOL...

Specify CONTINENTAL

The precision cutting tool must be even more accurate than the machine, the fixture, or the finished part. "Continental" cutting tools made by Ex-Cell-O (they run from a standard counterbore to all types of broaches and to special carbide-tipped tools of intricate design) are acknowledged to be among the best obtainable in design and manufacture and in actual production results.

CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

Skilled Hands

Cincinnati Hypro Vertical Boring Mills are created by the skilled hands of master machinists who have devoted a lifetime to producing boring mills that have

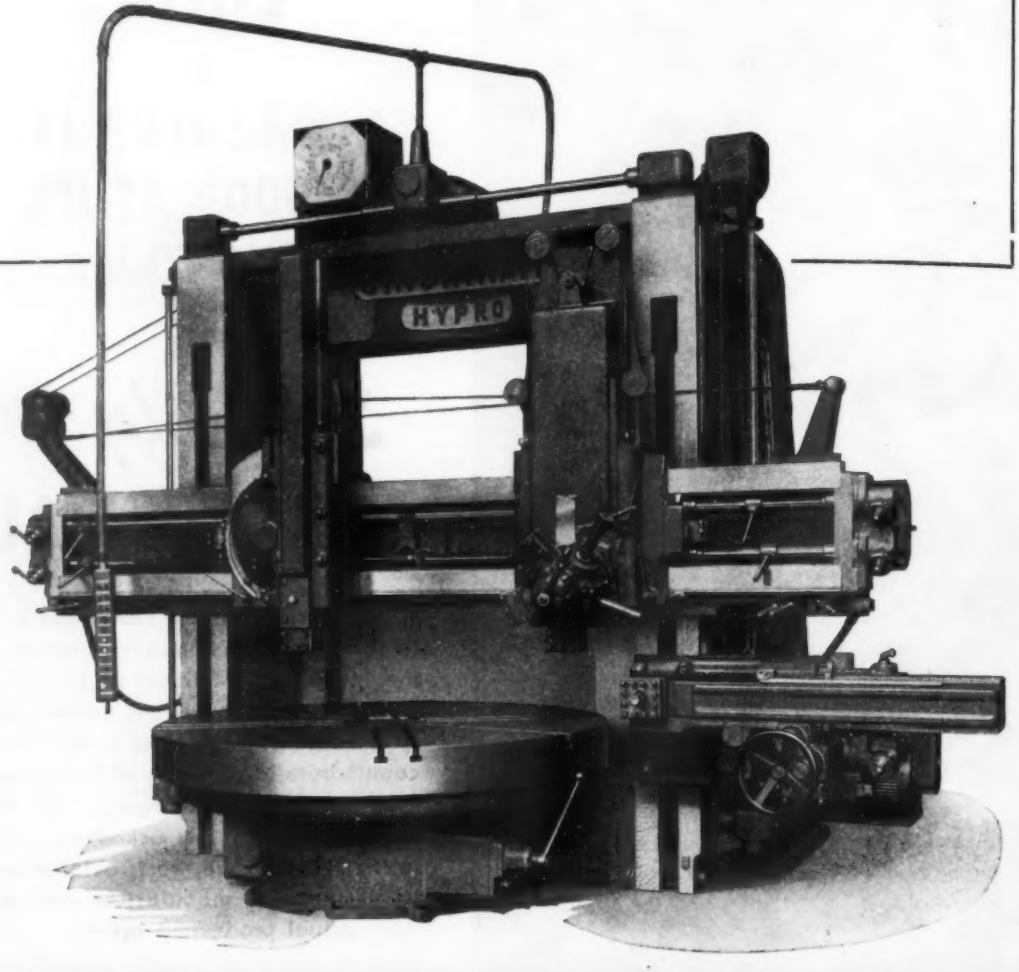
Everything

They are scientifically designed, superbly engineered for all types of heavy duty boring and turning.

These famous precision built boring mills have the speed, strength, power, rigidity—in fact everything to lower costs and increase profits.

Consider a Cincinnati Hypro Vertical Boring Mill in your post war planning.

Write for Bulletin A. M.-132—175 today.



Sizes—54" to 12', inclusive, and 12' to 18' Extension type.

THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

MEEHANITE *makes it possible!*

NEW SLIDE VALVE DESIGN PROVIDES IMPROVED PERFORMANCE

Electrol, Inc., Kingston, N. Y., recently designed a new hydraulic valve for use in fighter aircraft to aid in the control of the Auto-Pilot. After considerable experimentation it was found that a Meehanite spacer forming the valve seat and slide support permitted maximum successful operation of the unit.

The dense, uniform structure of Meehanite containing finely dispersed graphite particles (a structure controlled by Meehanite manufacturing processes) provides a fine self-lubricating bearing surface for a carburized and hardened steel slide. Three rubber O-rings are used to fit the spacer in the aluminum housing, permitting the use of aluminum, steel and Meehanite in close conjunction despite different coefficients of expansion.

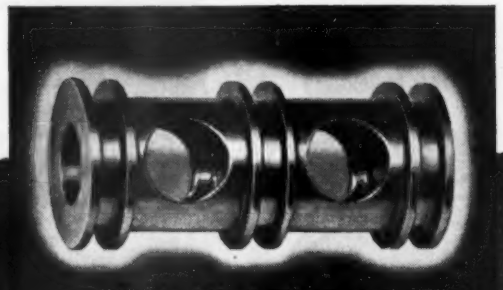
The unit has made it possible to hold the pressure drop to about one pound at three gallons per minute flow.

From a manufacturing standpoint the uniformity and machinability of the Meehanite Castings also contributed to reduce production costs.

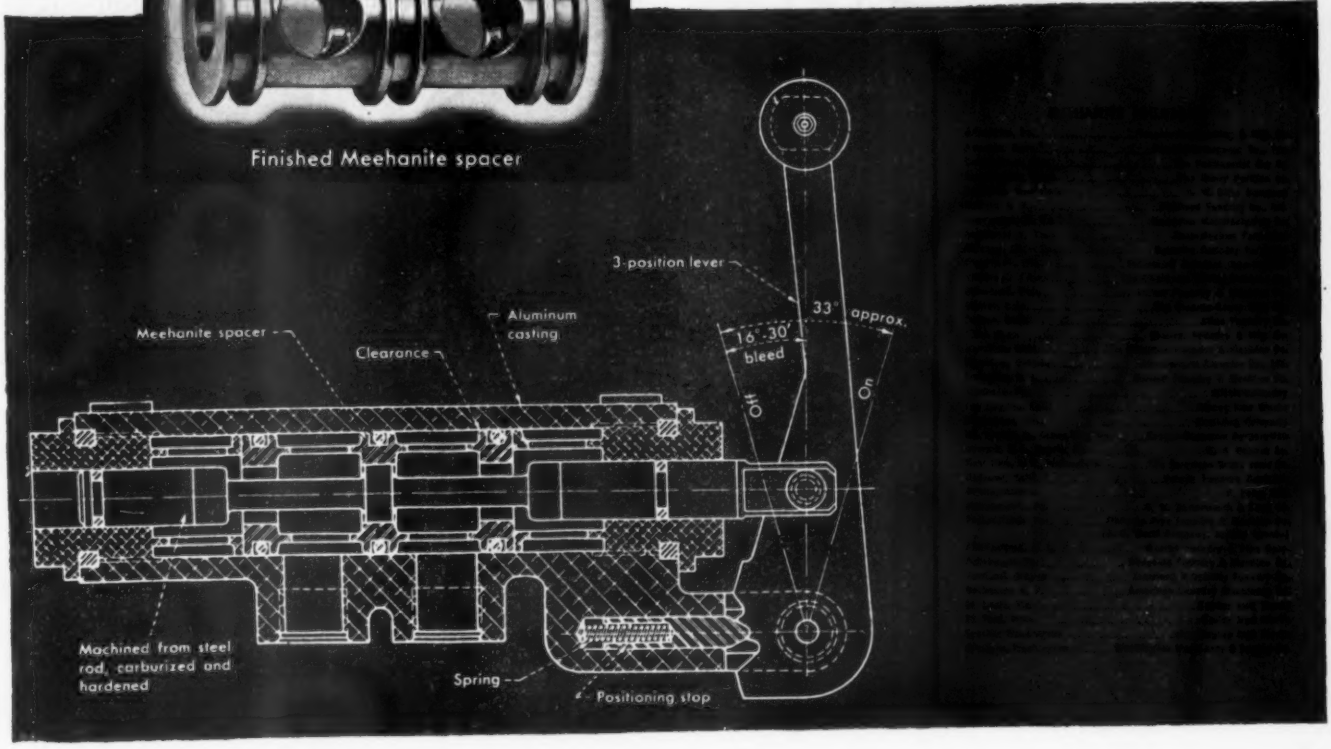
IN NEW PRODUCT DESIGN THE TREND IS TO MEEHANITE!

Write for Bulletin No, 18
"Meehanite—the Metal for Post-War Castings."

MEEHANITE RESEARCH INSTITUTE
NEW ROCHELLE, N. Y.



Finished Meehanite spacer



Snyder Special

HANDLES PARTS of VARIOUS SIZES

This Snyder special-purpose machine is designed to mill lubricating slots in large tapered valve bodies. It is fully adjustable as to the size and position of cuts and will handle parts from ¾″ diameter by 4″ length, up to 6″ diameter by 24″ length. In the job illustrated, four slots are cut, two long and two short.

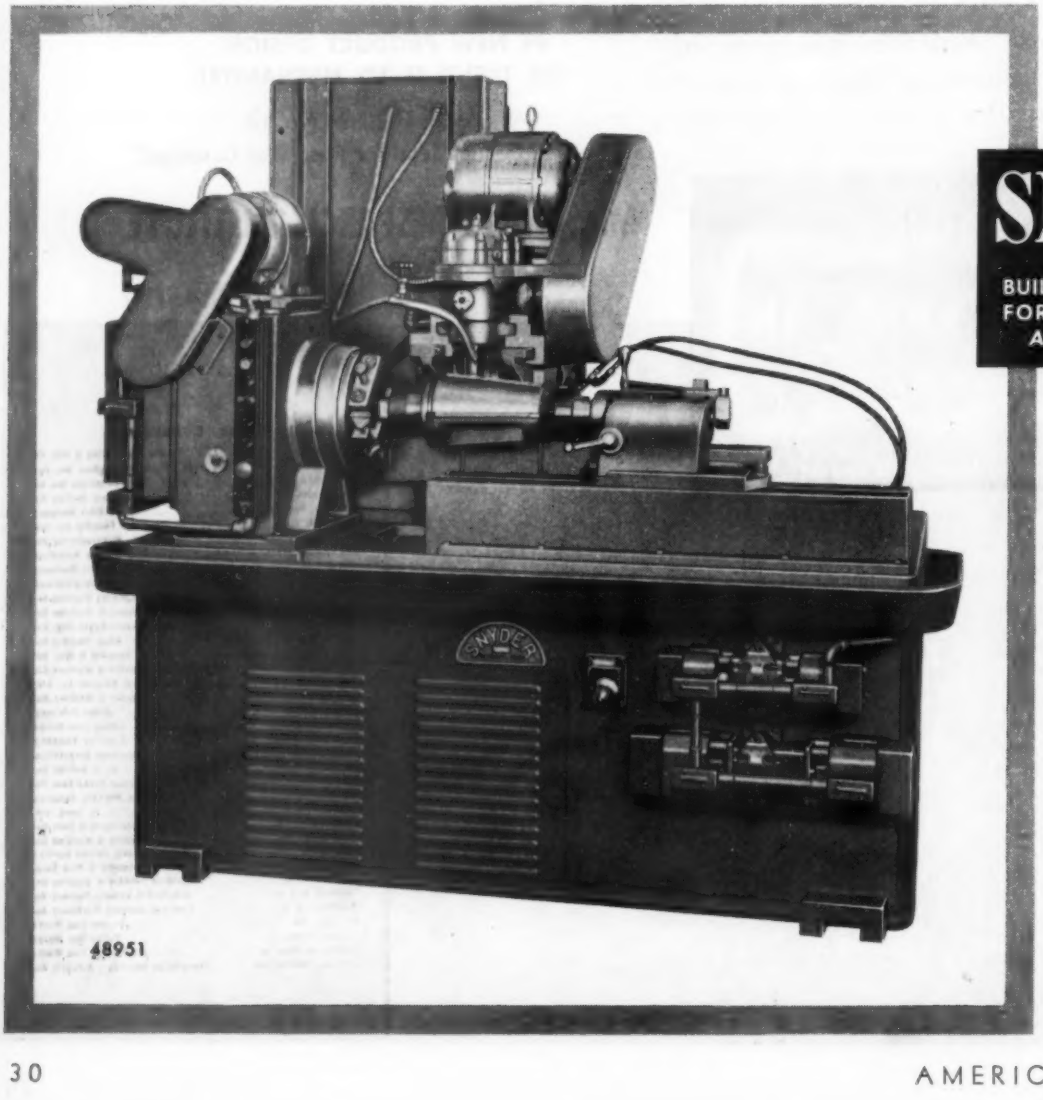
The part is positioned radially from the square end of the valve plug and stem and is held between centers. Indexing is by means of a motor-driven Geneva mechanism which includes a positioning pin and a master control drum governing the travel of the milling cutter head. This mechanism also selects automatically the length of each successive cut.

The spindle housing is installed on a cross slide, adjustable for depth of cut and respective diameter of work and for length of longitudinal feed stroke.

From starting position near the center of the slide the cutter head travels to the beginning of its cut, moves into the work, feeds for the full length of the cut, retracts and returns to center position.

The machine then indexes 90° and automatically selects the next required length of cut and so repeats the cutting cycle until all slots are completed. Hydraulic equipment is in the welded steel base. Coolant tank is separate from the machine.

The important benefits of this machine are: variety in size of parts that can be handled, operation by unskilled help, minimum operator fatigue and production increased many times over previous set-ups. Perhaps there are spots in your production line where Snyder "specials" can accomplish similar improvements. We invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette Avenue, Detroit 7, Michigan.*



SNYDER

DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries.

It is reported that . . . . . .

One of the obstacles in the way of large-size home television is the cost of the necessary aspherical lenses. A new material and method makes it now possible to mold these accurately of plastic at much lower cost. *Polaroid Corp.*

get ready with **CONE** for tomorrow

A "plastic foam" has been developed that is semi-rigid and weighs only about one-seventh as much as cork.—*U. S. Rubber Co.*

get ready with **CONE** for tomorrow

A western college is preparing courses in the management of small business, particularly for returned veterans. *Western Reserve University.*

get ready with **CONE** for tomorrow

Before the war we imported about one million glass eyes from Germany. Now an American manufacturer is reported to be filling a Russian order for 50,000 plastic eyes and to promise them for the use of our civilians later in the year. *American Optical Co.*

get ready with **CONE** for tomorrow

Three coal companies and six railroads are to collaborate in a million dollar research program to improve the coal burning locomotive. *Bituminous Coal Research, Inc.*

get ready with **CONE** for tomorrow

An automobile manufacturer is expected to enter the farm market with a number of new tools including a modified flame thrower for killing weeds. *Graham-Paige Corp.*

get ready with **CONE** for tomorrow

A new electronic piston ring inspection instrument uses beams of light to check accuracy within 0.001 inches in less than five seconds. *Sheffield Corp., Dayton.*

get ready with **CONE** for tomorrow

A new process claims to be able to electroplate aluminum with any of the conventional plating metals. *Alumon Euthone Co., New Haven.*

A new glass resists heat up to 1650 degrees Fahrenheit. *Vycor—Corning Glass Works.*

get ready with **CONE** for tomorrow

A new Diesel engine burns natural gas, coke-oven gas or sewage gas, as well as oil, without shutting down to exchange parts. *Cooper-Bessemer Corp.*

get ready with **CONE** for tomorrow

A new anodizing process makes magnesium resistant to corrosion. *Consolidated Vultee.*

get ready with **CONE** for tomorrow

The craft of gem cutting is being taught in this country to returned veterans in an effort to hold the advantage in this field that the war has given us. *Gabriel Williams, N. Y.*

A 96-pound bearing produced by powder metallurgy is claimed to be the largest of its type yet made. *Chrysler Corp., Amplex Div.*

get ready with **CONE** for tomorrow

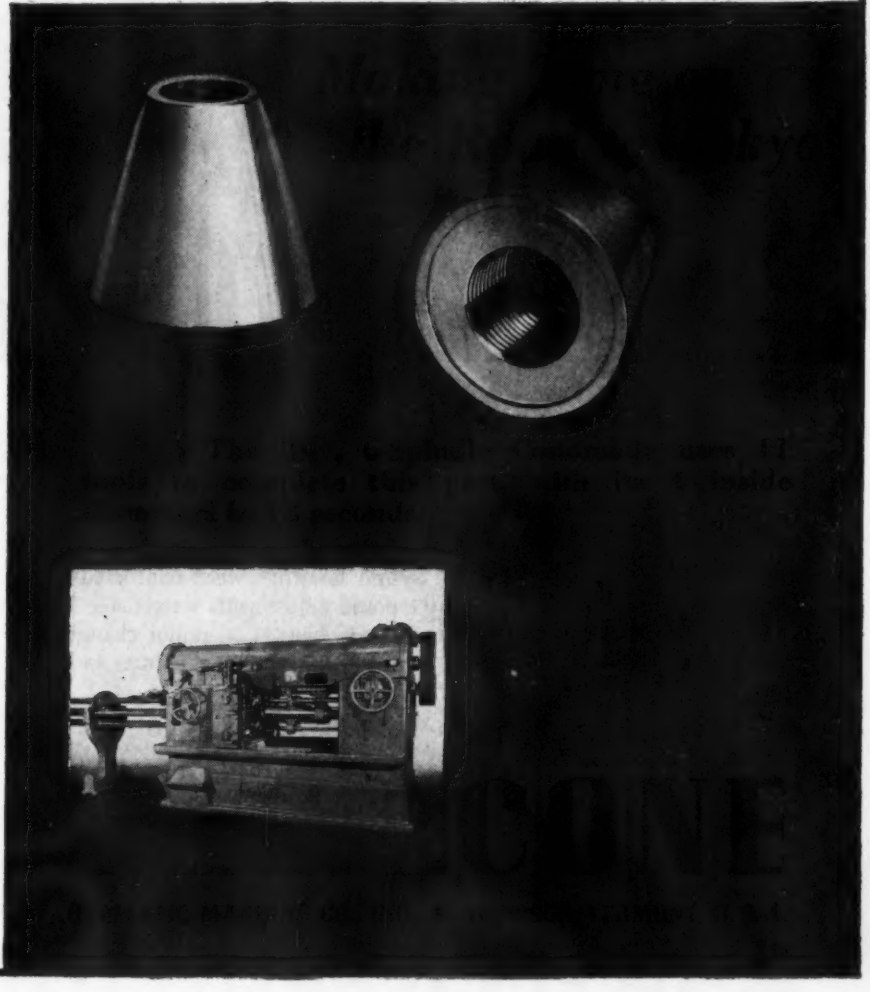
The first direct drive steam turbine locomotive to be built in the United States is undergoing tests to determine its adaptability to long-distance high-speed freight and passenger service. It is said to be capable of pulling a passenger train at 100 miles per hour. *Penn. RR Baldwin Locomotive Works—Westinghouse.*

get ready with **CONE** for tomorrow

A photographic technique is claimed to be so sensitive that it will record even differences in air pressure such as shock and sound waves or air jets. *Schlieren Method—General Electric.*

get ready with **CONE** for tomorrow

A new dynamometer can stop a 158 ton wheel, whirling 3 miles per minute in 18 seconds. *Westinghouse.*



How Allis-Chalmers Engineering Discovers New Ways to Build Better Motors for You.

WANTED: D-C Motors to Dive for Navy!

BUILD SUBMERSIBLE MOTORS to run 25 feet under water — and build 'em to run that way 90 days at a stretch! That's the tough assignment Navy engineers turned over to Allis-Chalmers.

Those motors had to: 1) withstand sea pressure; 2) stay waterproof; 3) be light in weight.

No. 1 problem was . . . *how to build water-tight casings.* A-C engineers experimented, found the solution in fabricated steel.

Quickly, individual casing parts were built. Subsequent hydrostatic tests applied to them showed molecular arrangement and carbon content of steel to be ok. Result —only a heavy weld between fabricated parts was needed to assure water-tightness!

Now the going was easier. For adequate surface seal, field yokes of one-inch rolled steel were used. End housings were reinforced. Exposed adjustments were made leakproof. Then . . . minor changes in insulation, at other points, and the problem was solved.

* * *

"What's all this got to do with *my* problems?" you may ask. Just this . . . Everytime A-C tackles the job of building special motors for extra-tough war applications, like this one, it also discovers important new ways to build better *standard* motors for you!

That's why you hear it said so often, *"You can depend on Allis-Chalmers Motors!"* ALLIS-CHALMERS, MILWAUKEE, WIS.

A 1889

You Can Depend on ALLIS-CHALMERS Motors

This

THOMPSON GRINDER

saves time . . . cuts costs . . . assures accuracy . . . on

DIE BLOCK GRINDING

● The Thompson type BB 12" x 10" x 24" Grinder is not only handling a difficult job easily and quickly but is maintaining original accuracy of die blocks.

The use of a 20" wheel on this machine permits re-grinding of die blocks without removing guide pins. This method of grinding eliminates inaccuracies in re-assembly and speeds up the job of maintaining the dies.

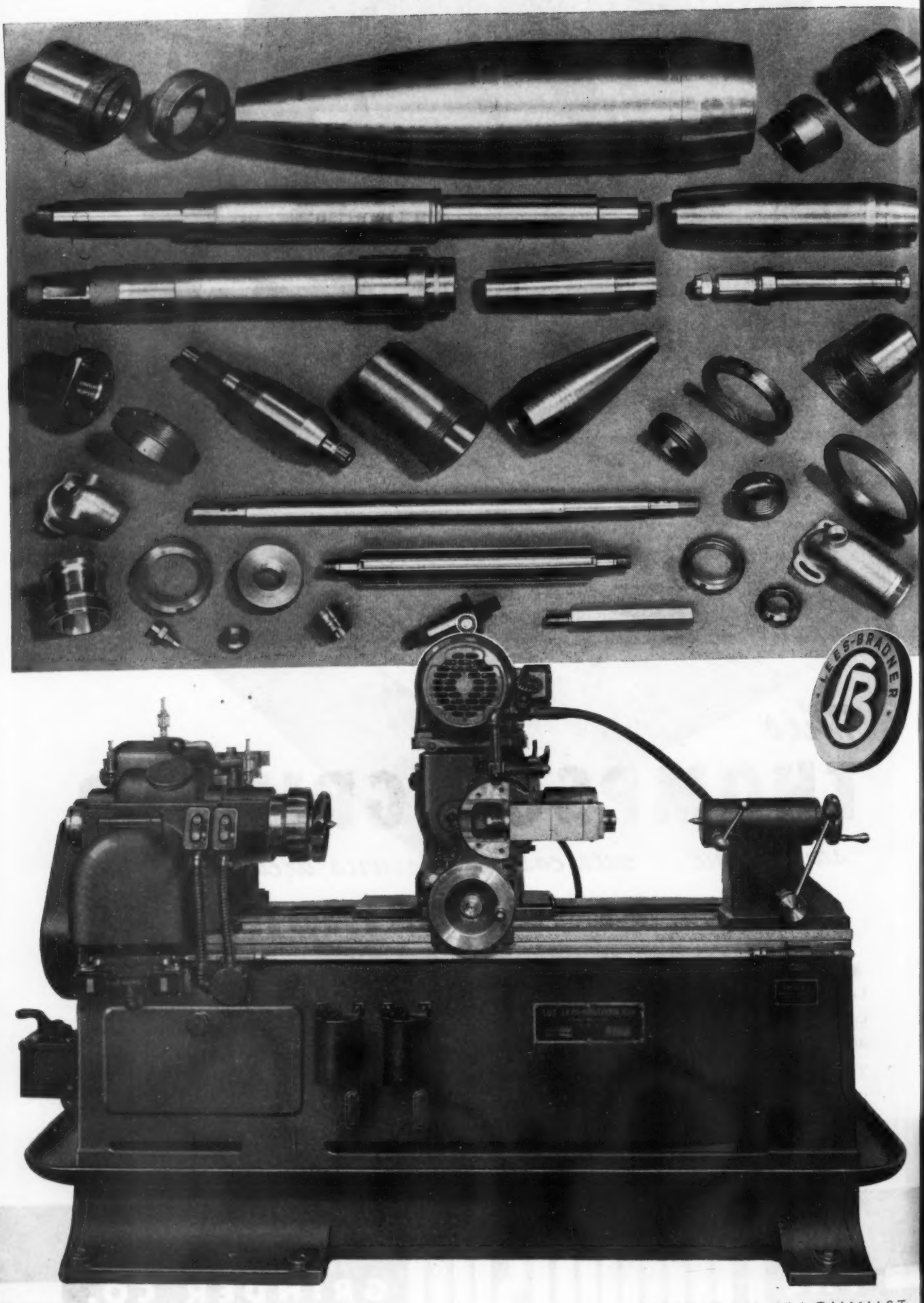
This is typical of the many ways Thompson Hydraulic Grinders are meeting specific grinding requirements—maintaining accuracy —and reducing ultimate grinding costs.

There's a Thompson Grinder for your job. A complete range of types and sizes are available from 6" x 12" x 18" to 36" x 36" x 240".

Write for bulletin.

THE **Thompson** GRINDER CO.

SPRINGFIELD OHIO


LEES-BRADNER

Judge a machine by the work it does

★

LEES-BRADNER

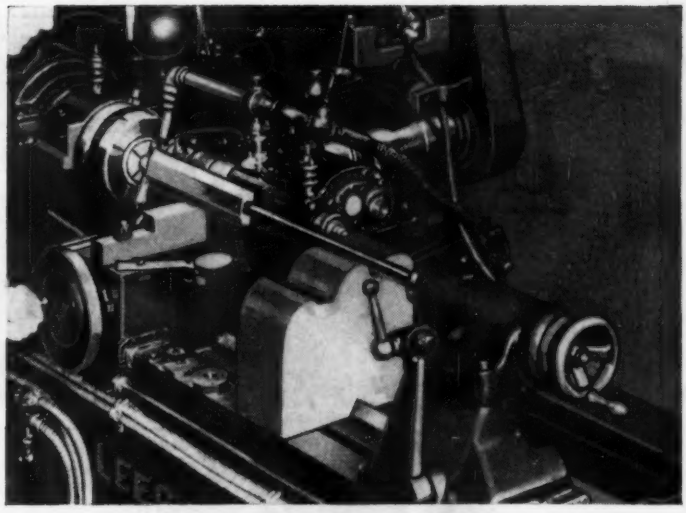
MODEL LT THREAD MILLER

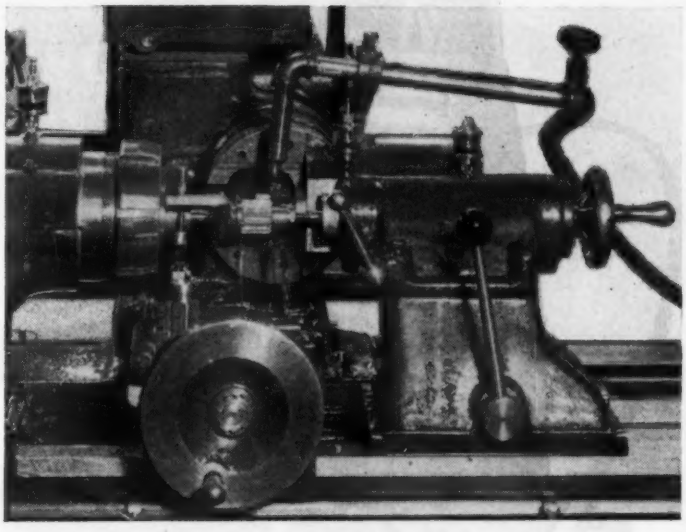
The group of parts on the opposite page give you a clear picture of the precision threading possibilities of the Lees-Bradner LT Threading machine.

Its acceptance by aircraft, automotive, armament and allied industries provides convincing proof of performance, production and versatility.

Thread milling is recommended where close accuracy is important. Lead screws and other precision threads usually chased can be threaded in less time, with greater accuracy and uniformity on a Lees-Bradner Thread Miller—and with less experienced operators. This is accomplished with a cutter, the work being held between centers. On long shafts the work can be held in the workhead by means of a collet with tailstock for support.

The work shown is typical. Why not consult a Lees-Bradner Engineer on your precision threading requirements.

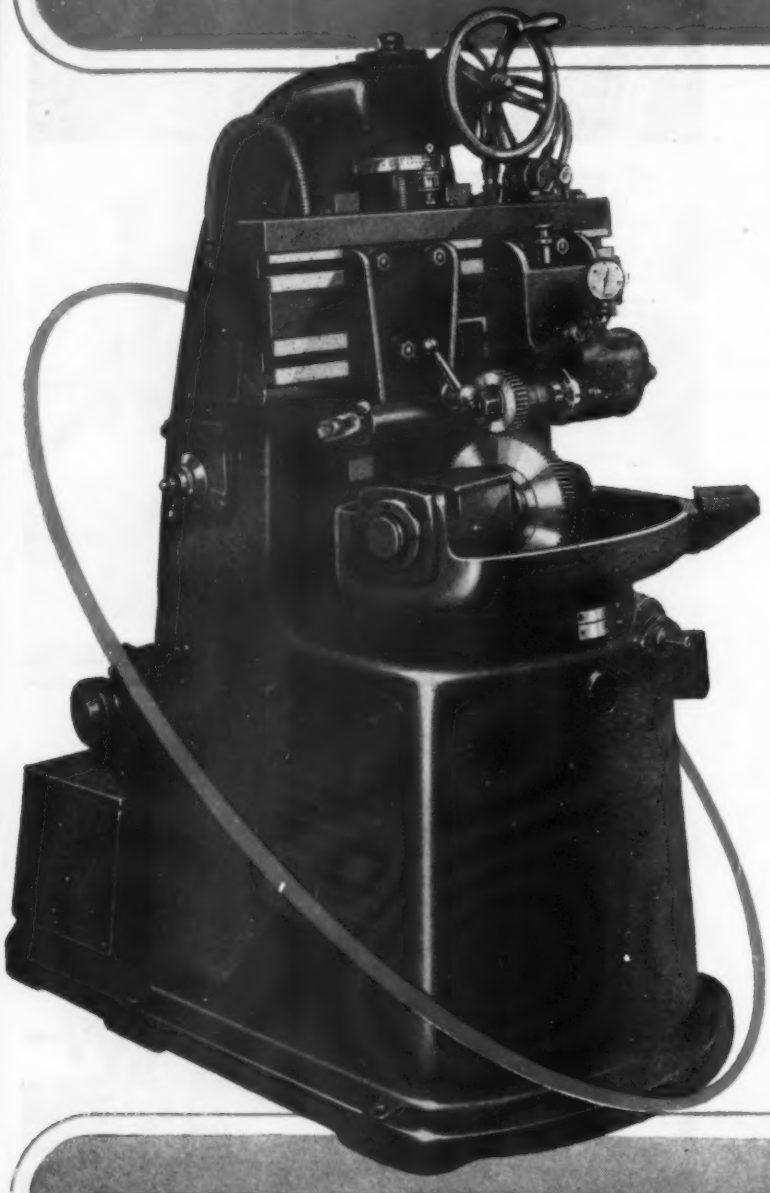




The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

Use RED RING Lapping for Gear Teeth



When gear tooth surfaces have to be lapped, either to meet specifications or to correct heat treat distortion, the Red Ring Rotary Crossed Axes Method is preferred because of its unusual speed, accuracy and economy.

The Red Ring lap tooth surfaces slide over the work gear teeth in two directions simultaneously—a true lapping action. Furthermore, the pressure exerted on the work gear teeth is the same below the pitch line as it is above. This produces uniformly lapped tooth surfaces.

Spur, helical, shoulder and cluster gears with high, low, or ELLIPTOID tooth forms may be lapped on this machine. The machine is fully automatic and adjustable. If desired, the automatic cycle may be set to remove more stock from the drive face of the teeth than from the opposite face. Skilled operators are not required.

WRITE
FOR DESCRIPTIVE BULLETIN

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN DETROIT 13, MICH.

Specialists on Spur and Helical Involute Gear Practice
Originators of Rotary Shaving and Elliptoid Tooth Forms

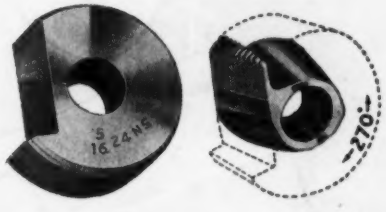
VERS · O · TOOLS with *Circular Chasers*

– CUT CLEANER THREADS
– LAST LONGER
– SAVE TIME

1 Class 3 precision holds throughout long runs. Reground chasers quickly inserted without disturbing the setup.

After replacing chasers,
THE FIRST PIECE IS PRODUCTION

2 Chasers last longer, because they may be reground through 270° circumference. Ten to fifty times longer chaser life.



3 Time saved, because replacing chasers is a two-minute job. No trial runs needed.

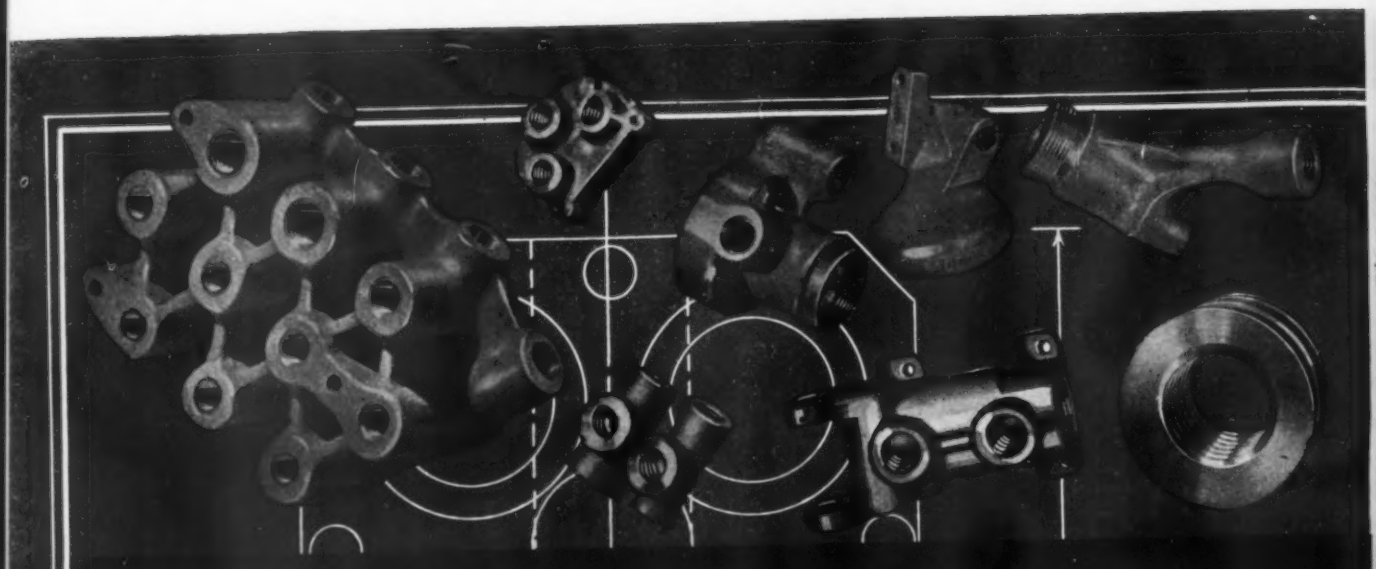
Catalog D-42-B gives complete details

Ground Thread Circular Chasers and Circular Cutters, used with the Vers-o-tool Head, do all these precision jobs—thread cutting, end turning and forming, knurling, burnishing, combination threading and turning.

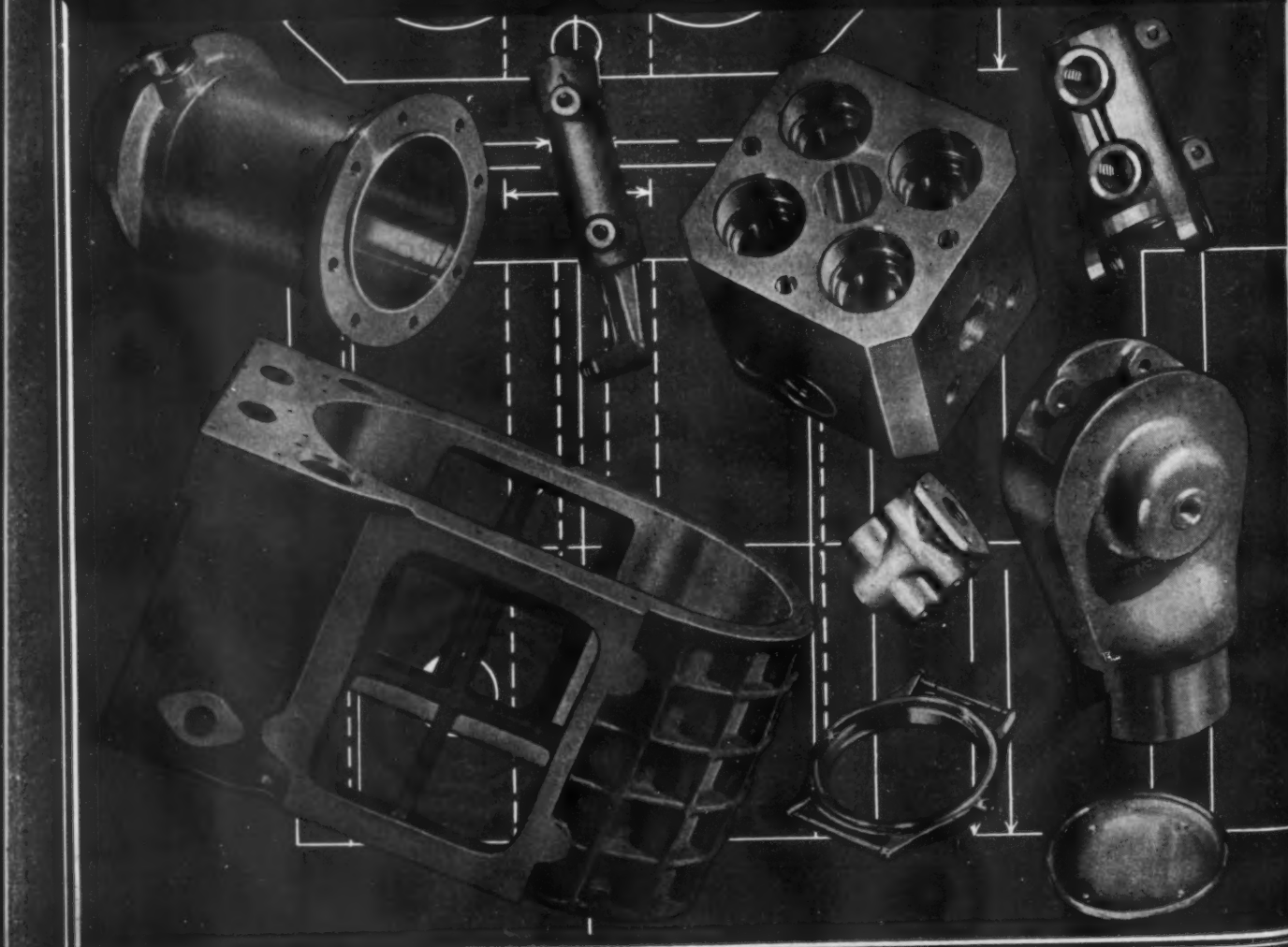
The NATIONAL ACME CO.

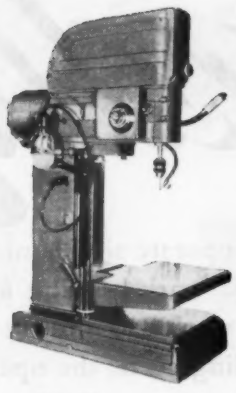
170 EAST 131st STREET · CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics · Single Spindle Automatics · Automatic Threading Dies and Taps · The Chronolog · Limit, Motor Starter and Control Station Switches · Solenoids · Centrifuges · Contract Manufacturing



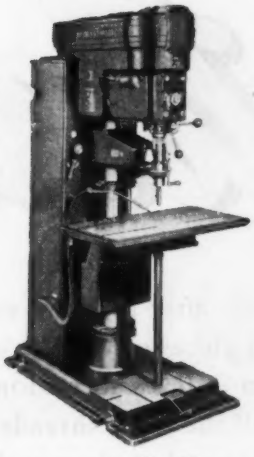
WHAT PRECISION TAPPING OR





No. 10,
Capacity 0-80 to 10-24

No. 11,
Capacity 8-36 to ⅞"



No. 12,
Capacity ⅜" to 2½"

No. 11R,
Radial Capacity 8-36 to ⅞"

THREADING JOB DO *YOU* WANT DONE?

A WATCH company now taps *gold* cases for waterproof watches on a Warner & Swasey Precision Tapping and Threading Machine.

In New Jersey, a Warner & Swasey Machine doubles production of *steel* fuse parts.

In the Mid-west, a Warner & Swasey Machine gives the finishing touches—43 tapped holes—to a huge *aluminum* casting—with hours of valuable machining time lost if every operation isn't perfect.

In a Naval Arsenal, a Warner & Swasey Precision Tapping Machine tackles the job of tapping Class 3 fits in tough *tool steel,* and does 1100 of them in a 50-minute work hour.

In plants all over the United States, these precision machines are proving more than a match for the toughest tapping and threading jobs. In steel, brass, aluminum, magnesium—even gold, they are cutting Class 3, 4, and 5 threads with new highs in production and new lows in scrap and tap loss.

Whatever your tapping and threading problem — large parts or small — fine threads or coarse—let a Warner & Swasey representative show you how the new, exclusive tapping principle embodies in these machines will bring you extra profits—now or for postwar!

***SPECIAL OFFER**—Give us a sample part or print and we'll tell you exactly what you can expect from your new Warner & Swasey Precision Tapping and Threading Machine!*

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

WARNER & SWASEY Machine Tools *Cleveland*

TURRET LATHES, SADDLE AND RAM TYPES

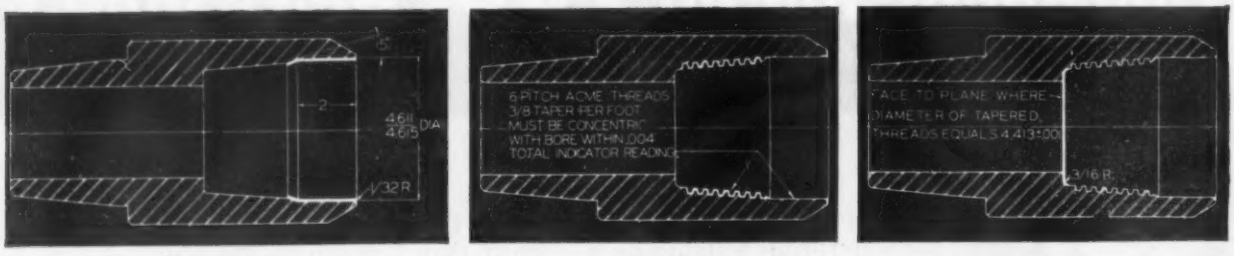
CHUCKING AND BAR TOOLS

PRECISION TAPPING AND THREADING MACHINES

Automatically

In the automatic cycle after loading, stations No. 1 and No. 3 operate simultaneously to bore and face two pieces of work at opposite ends of a central work-holding fixture . . . The fixture then indexes to station No. 2 where both the work and tool rotate to rough and finish mill the taper threads . . . During this threading cycle, the operator unloads and re-loads another piece at the opposite end of the fixture.

This Cross Special Machine is an example of the new and faster machining methods which will be the means of realizing profit in the next era of intense competition. May we help you prepare for it? Write The Cross Company, Detroit 7, Mich., Dept. 141.



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New York • Chicago • DETROIT • Cleveland • Cincinnati

Processing

OIL TOOL JOINTS

PRECISION BORING, THREADING AND FACING 16 HARDENED STEEL PIECES AN HOUR . . .

4 times faster than the former rates.

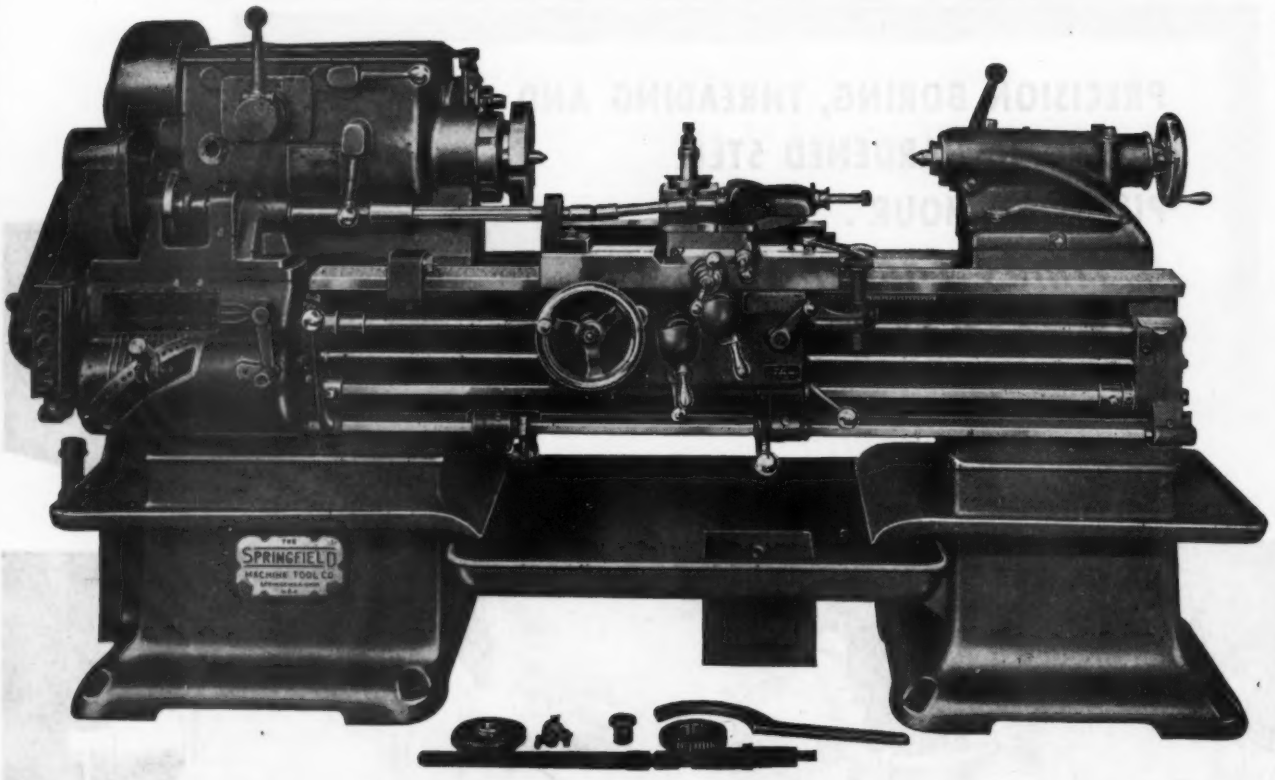
SPECIAL MACHINES

for automatically performing any one or a combination of metal cutting operations

TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

Choose

SPRINGFIELD



GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own shop . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELD can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions make it SPRINGFIELD Geared Head Lathe . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

1945 REVISED EDITION
NOW READY FOR DISTRIBUTION

The NEW

Van Keuren

CATALOG and HANDBOOK No. 33

This new, revised Technical Catalog and Handbook contains 160 pages of practical, useful information in ready reference form on precision measuring. It describes, by text and illustration, various accepted methods and equipment for checking accuracy to hundred thousandths and millionths of an inch.

Through the use of the Van Keuren equipment described in this handbook, many outstanding improvements in production and product quality have been attained, and closer tolerances more easily achieved.

PARTIAL LIST OF CONTENTS

NEW PRODUCTS:

New Light Wave Equipment with fused quartz optical flats.
New Laboratory Type Monochromatic Light.
New Solid Square Master Blocks having permanent accuracy.
New and complete Gear Measuring Tables from 5 to 500 teeth.

ENGINEERING DATA

How to measure standard and special screw threads.
Screw Thread data including tables of basic diameters and tap drill sizes for all American threads.
Thread proportions for American and Foreign threads.
Bureau of Standards measuring wire specifications.
How to measure spur and helical gears.
How to measure angles.
How to use optical flats.
Notes on gaging holes.

THE *Van Keuren* COMPANY

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THE VAN KEUREN CO., 176 WALTHAM ST., WATERTOWN 72, MASS.

Kindly send me a copy of your 1945 New and Revised Catalog and Handbook No. 33. It is understood that this request incurs no obligation.

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25th Anniversary

IT'S SO SIMPLE

to cut ACCURATE threads from 1/16" to 3 1/4" diameter with GEOMETRIC Rotary DIE HEADS

Simple and "fool-proof" in construction — easy to use, easy to re-sharpen — yet a light, compact, sensitive precise tool that will cut from 1/16" to 3 1/4" diameter —

That's the essence of the reasons why GEOMETRIC Rotary DIE HEADS have proved so popular for use on live spindle machines, especially automatic screw machines.

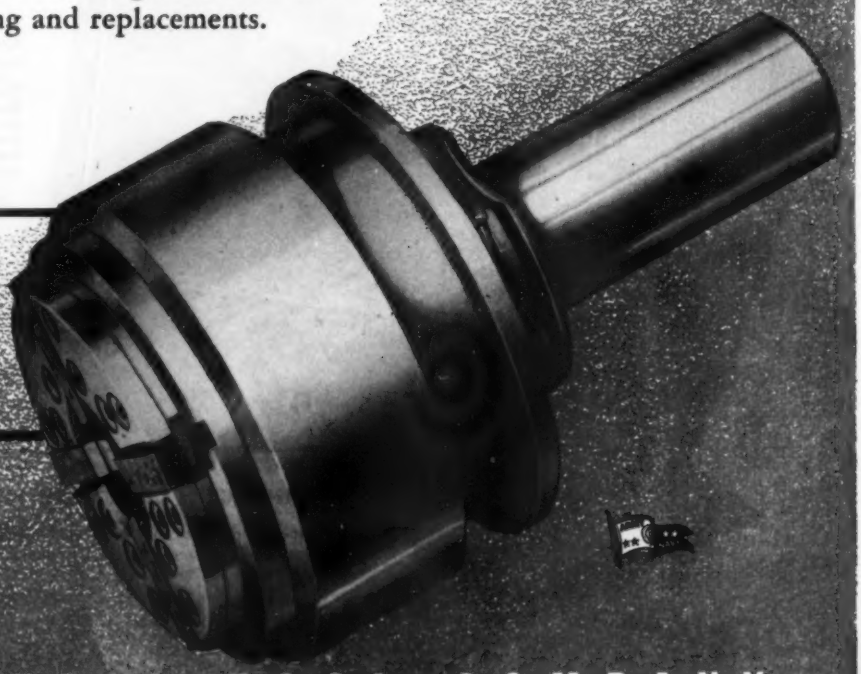
Note the simple, compact design of the head — no awkward adjusting screws — no stop levers — perfectly balanced.

Another important feature — note how the chasers protrude through the front of the head so they can cut close to a shoulder without having to remove the face plates.

Simplicity is the key to the increasing trend toward the use of GEOMETRIC Die Heads — saving time and expense in operation, re-sharpening and replacements.

GEO MET RIC

Built in two types—Style KD for the coarser pitches—Style CK for the finer pitches. Write for a FREE booklet on this tool.



The GEOMETRIC TOOL COMPANY

New Haven 15, Connecticut

A DIVISION OF THE GREENFIELD TAP AND DIE CORPORATION

NEW TOOLS FOR IRON ELEPHANTS

A "never forgetter" weighs as much as sixty men. It is the machine tool of the animal kingdom. Like many machines it would be nearly helpless without its one special tool—a trunk which contains 40,000 separate muscles and can pick up a peanut or a ship's mast.

But it could do a greater variety of jobs, execute more precise operations, and turn out astounding volume if it could invent and use more kinds of special tools, and perform multiple operations.

Perhaps too many of your machines are iron elephants employing a single tool when with special tools and fixtures they could be multiplying your production many fold.

"Never forget" your iron elephants that can eat their heads off, and never forget that Vulcan designs tools that multiply their usefulness.

The VULCAN TOOL Co.

730 LORAIN AVENUE ★ DAYTON 1, OHIO

ENGINEERING PROCESSING DESIGNING BUILDING
TOOLS DIES JIGS GAUGES SPECIAL MACHINERY

THE TOUGHER THE SERVICE THE BETTER THE TEST...

Many small tools are capable of handling easy jobs with a certain degree of efficiency and economy, whereas on the tough job they might not stand the gaff.

Today, most jobs are tough, calling for tough tools. Then too, because of small tool shortage, all tools must sooner or later be assigned to gruelling service making it imperative that every small tool be capable of maximum performance in long, hard work.

The test of UNION TOOLS is to put them to work under today's conditions and let results dictate the tools you buy. On such a basis UNION will be the "Tools You Buy Again."

THE UNION LINE

Twist Drills—Milling Cutters—Reamers—Hobs—Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

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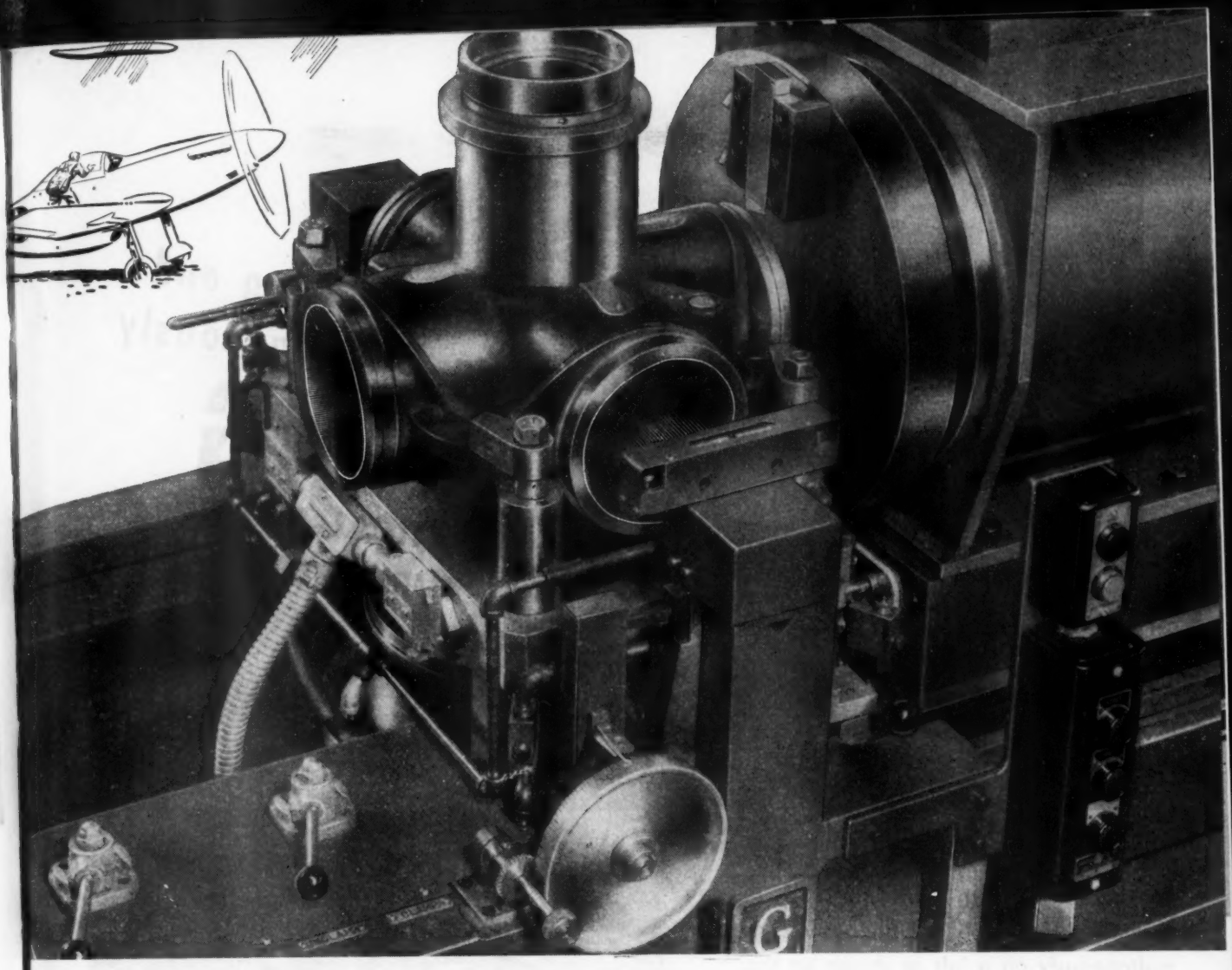
UNION

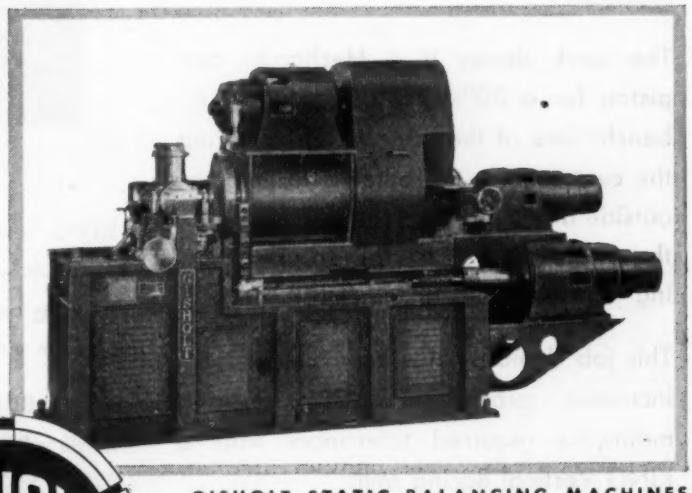


THE *New Way* TO BALANCE PROPELLER HUBS

low, the unbalance in aircraft propeller hubs is *located, easured* and *corrected* in one series of operations—ithout removing the workpiece from the machine.

Incorporated with a Gisholt Static Balancing Ma-ine is a special clamping fixture, hydraulically oper-ed, which holds the workpiece while a rotating tool een at right) turns a groove in the barrel portion of e hub, removing the exact amount of metal necessary obtain accurate balance.

The efficiency of this set-up has turned a difficult lancing problem into a routine production job. It is ical of the way Gisholt engineers are solving a great ny problems with Gisholt balancing equipment pted to the specific requirements of the . If you have a problem in static or dy-mic balancing, bring it to Gisholt.



GISHOLT STATIC BALANCING MACHINES

On these machines, the indicated amount of unbalance is converted into correction to be applied by setting the hand wheel at the right. Pushing a start button then causes the cutting tool to rotate and to be fed in so as to remove the unbalance—correction removal is quick, easy and accurate. The workpiece is removed from the machine perfectly balanced. Complete information on Gisholt static and dynamic balancing machines is available on request.

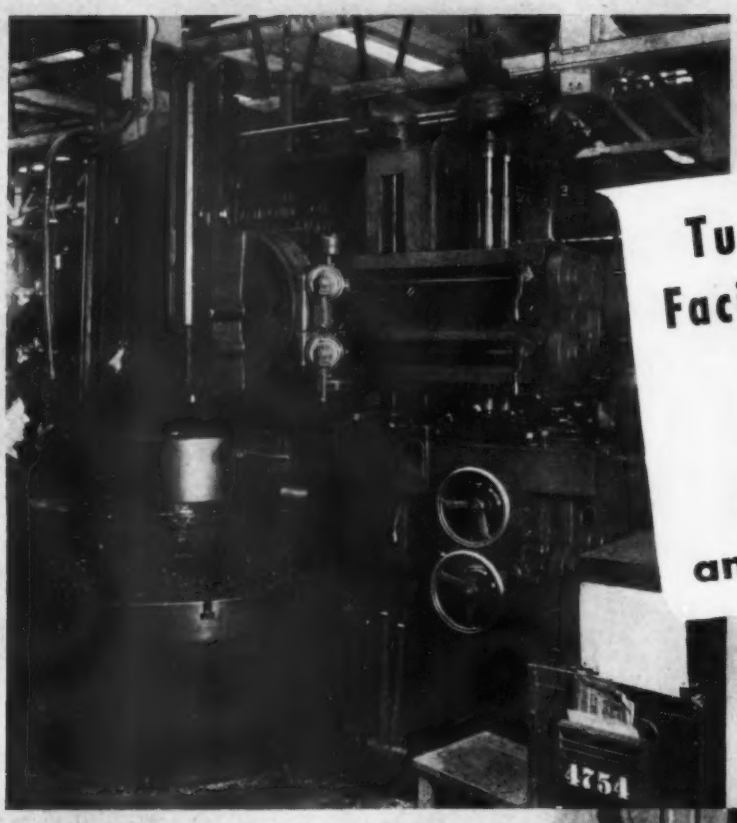
SHOLT MACHINE COMPANY

1 East Washington Ave. • Madison 3, Wis.

ok Ahead . . . Keep Ahead
. . . with Gisholt

GISHOLT

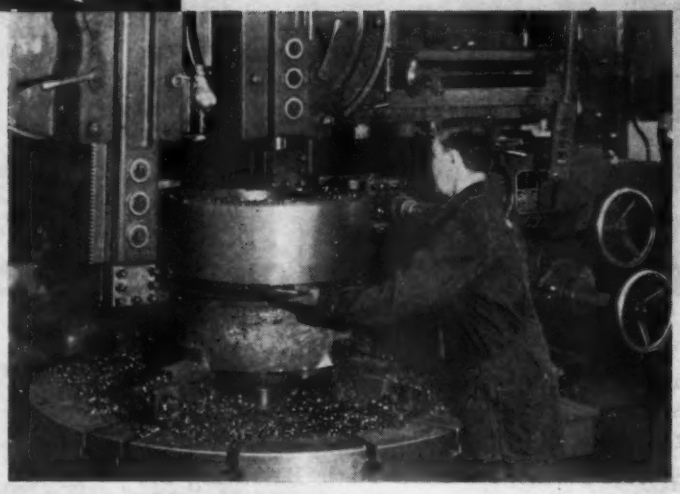
RRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



Turning, Boring and Facing Simultaneously

KING

VERTICAL BORING and TURNING MACHINE



● There's nothing particularly spectacular about using 3 cutting tools simultaneously on a job as shown on this King 62 inch Vertical Boring Mill. That's merely capitalizing on a few of the many advantages offered in this precision machine.

The work shown is a Mechanite cast piston for a 30"x22'.0" hydraulic push bench. One of the three heads is boring the center hole—the other is turning the outside diameter—and the third is facing the under side of the piston. The turning tolerance plus or minus .002 inch.

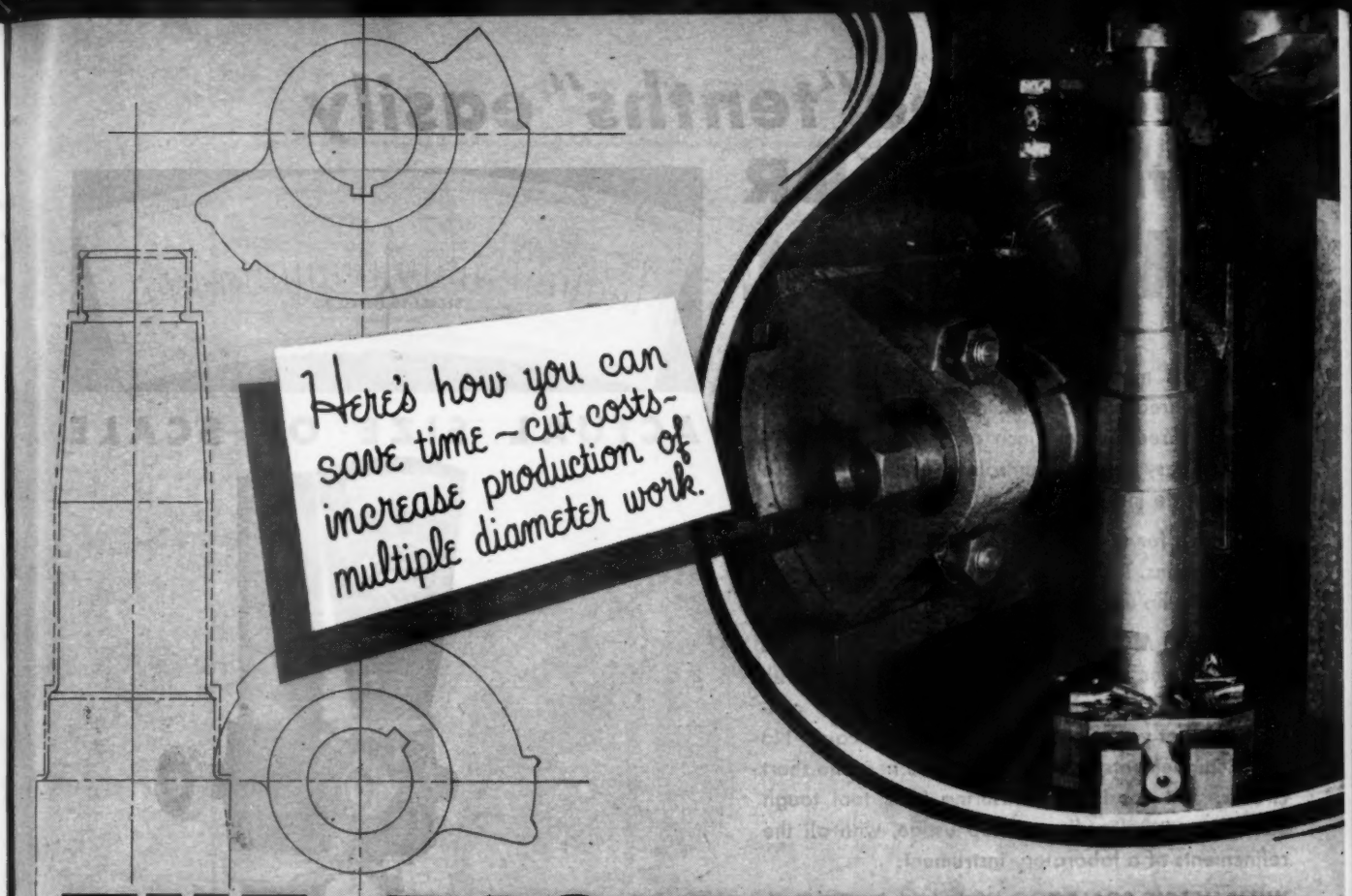
This job demonstrates how one concern increases production—cuts costs—and maintains required tolerances with a KING Vertical Boring Mill.

KING Vertical Boring & Turning Machines have the rigidity to produce precision work over long periods—flexibility to handle turning—boring—facing and similar operations singly or combined—and versatility to perform various operations on a wide range of work.

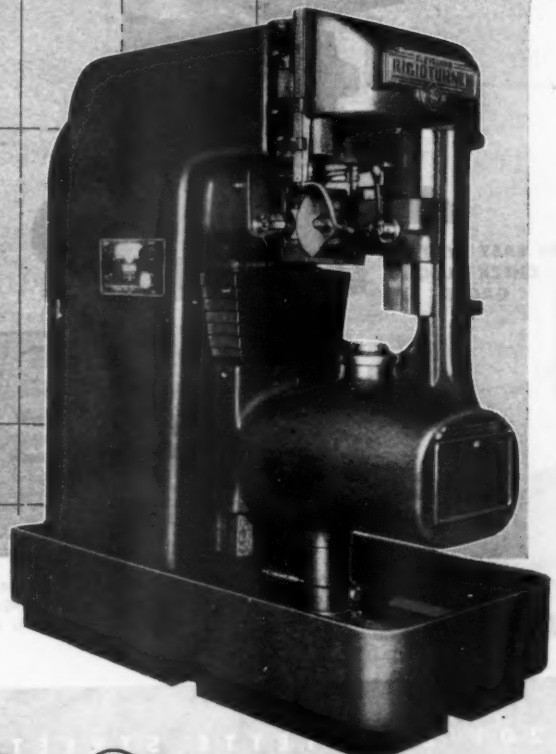
KING BUILDS Vertical Boring and Turning Machines exclusively—single column types from 30" to 42" inclusive—double column types 52" up to 12 feet.

THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY



THE RIGIDTURNER

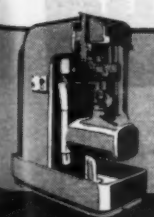


● When it comes to faithful reproduction of precision turning work you can depend on the RIGIDTURNER.

Shown is a typical example. Note in the diagram a 7.844 inch section of the work is completely turned in a single pass of the cutter. This includes 5 different diameters, a chamfer at the top, an undercut operation and four shoulders one of them beveled. The material is 3240 steel and the cutter removes .050 stock. Floor to floor production time averages 7 minutes per piece and production runs 75 pieces per cutter grind.

The all-around rigidity of construction—the sturdy support both in front of and behind the cutter—and simplicity of operation assures accuracy and dependable duplication of work in small lots or in the thousands.

Our Rigidturner bulletin tells how the machine works—what it will do—and how it reduces costs.



The CLEVELAND HOBBING MACHINE Company

General Offices:
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BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

You can see "tenths" easily with the SCHERR COMPARITOL

ACTUAL SIZE OF SCALE

It multiplies measurements visually by *more than seven hundred*—actually makes .001" occupy the space of three-quarters inch on the scale. On this basis it's easy for even untrained help to do close and accurate inspection.

No need for educated "feel" as with micrometers or snap gages. The Comparitol gives the same result, no matter who uses it.

ONLY TWO MOVING PARTS in the patented and exclusive lever construction. Extreme sensitivity with light tension, and almost nothing to wear—a construction that you might call "ruggedly delicate." No electrical elements, no changes due to heat, no short circuits. Just consistent measuring in a tool tough enough to stand ordinary shop usage, with all the refinements of a laboratory instrument.

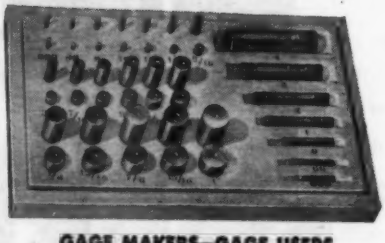
WITH METRIC SCALE TOO—If desired the Comparitol can be supplied with scale in metric divisions, reading to .002mm.

Many attachments available for special uses—fitted V-blocks, tables, special forms. Feeler point either hardened steel ball, or flat as desired. Also diamond and tungsten carbide points.

Hundreds of shops are today making new speed records with Comparitol in the accurate inspection of small parts with critical dimensions. Is yours among them? If not, write us for full details and descriptive bulletins.

USE ULTRA-CHEX BLOCKS
to set your Comparitol. 34 standards give 80,000 combinations between .300" and 8", in steps of 1/10,000". Complete set, $125.00.

THE EASY WAY TO CHECK PLUG GAGES



GAGE MAKERS—GAGE USERS
Save time by finishing plug gages from the Scherr set of plug gage blanks. 36 blanks, for plugs .029" to 1.010". Also handles. Complete set, $49.50.

GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

OUT OUR WAY

WHY, THIS IS SO LIGHT AN' CLEAN THAT I WOULDN'T MIND WORKING HERE MYSELF! I ALWAYS THOUGHT SHOPS WERE TERRIBLY DIRTY, OILY, GREASY PLACES!
THEY WERE, LADY-- BUT THAT WAS BEFORE SPEEDI-DRI!
"JUST LIKE HOME"
J.R.WILLIAMS
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SPEEDI-DRI is a quadruple-threat for taking up grease and oil. It saves man-power, time, money, and the lives and limbs of employees.

SPEEDI-DRI is safety's magic carpet. It cuts down the danger of falls and fires on oil-slick floors. It is a granular material . . . light in color . . . with a continuous thirst for oil or grease. It blots oil and grease up out of pores, cracks, and crevices, as a blotter takes up ink.

If you're spending too much man-power and money on floor-cleaning, let us show you what SPEEDI-DRI can do for you. No gangs of trained men, no costly machines, no inflammable solvents or dangerous caustics, no back-breaking scrubbing. Just spread a carpet of SPEEDI-DRI on the dirty floors; then sweep up with an ordinary broom. Floors will be bright, bone-dry, non-skid.

For a big FREE sample, write today . . . SPEEDI-DRI for oils and greases . . . SOL-SPEEDI DRI for coolants, syrups, acids, oils, etc.

SUPPLIERS: East — Refiners Lubricating Co., New York 1, New York.
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SPEEDI·DRI
OIL AND GREASE ABSORBENT

WHAT'S AHEAD FOR YOUR BUSINESS?

Find Out Today How EX-CELL-O'S Complete Parts Production Facilities Can Help You Meet Tomorrow's Tough Competition

With a complete organization under one responsible management . . . *an organization built upon years of varied engineering experience, modern machining methods and heat treat facilities, and practical inspection staffs* . . . Ex-Cell-O probably has the exact solution to the parts production problem you face.

Ex-Cell-O field engineering representatives will be very glad to talk it over with you.

SEE EX-CELL-O FIRST

EX-CELL-O's *facilities:*

PRODUCTION ENGINEERING

The Ex-Cell-O organization, with skill, facilities and modern methods that have made a wartime record, can make an important contribution in the planning of quantity production of quality parts and unit assemblies for your postwar product.

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Induction Heating
Laboratory for Heat Treat Control Including Micro Examination and Photography
Atmosphere Control Continuous Hardening Furnaces
Atmosphere Control Box Hardening Furnaces
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Gas Carburize Furnaces
Box Carburize Furnaces
Pack Anneal Furnaces
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Cyanide, Lead, and Neutral Salt Pot Furnaces
High Speed Steel Atmosphere-Control Vertical and Horizontal Hardening Furnaces
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Sub-Zero Heat Treating Equipment

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Multiple Vertical Turret Lathes
Multiple Spindle Automatic Screw Machines
Single Spindle Automatic Screw Machines
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Single and Multiple Spindle Drilling Equipment
Plain O.D. Grinders
Plain I.D. Grinders
Milling Machines
Broaching Machines
Precision Thread Grinders
Precision Boring Machines
Lapping Machines
Special High Production Equipment

UNIT ASSEMBLIES

For many years Ex-Cell-O has supplied large and small manufacturers with parts and has also supplied many parts in unit assemblies after machining, heat treating and grinding.

INSPECTION

Ex-Cell-O has always maintained that quality in a product is not the result of accident; that quality is built into a product by rigid adherence to accepted quality standards . . . standards that are upheld at Ex-Cell-O by efficient inspection at every step of the machining process.

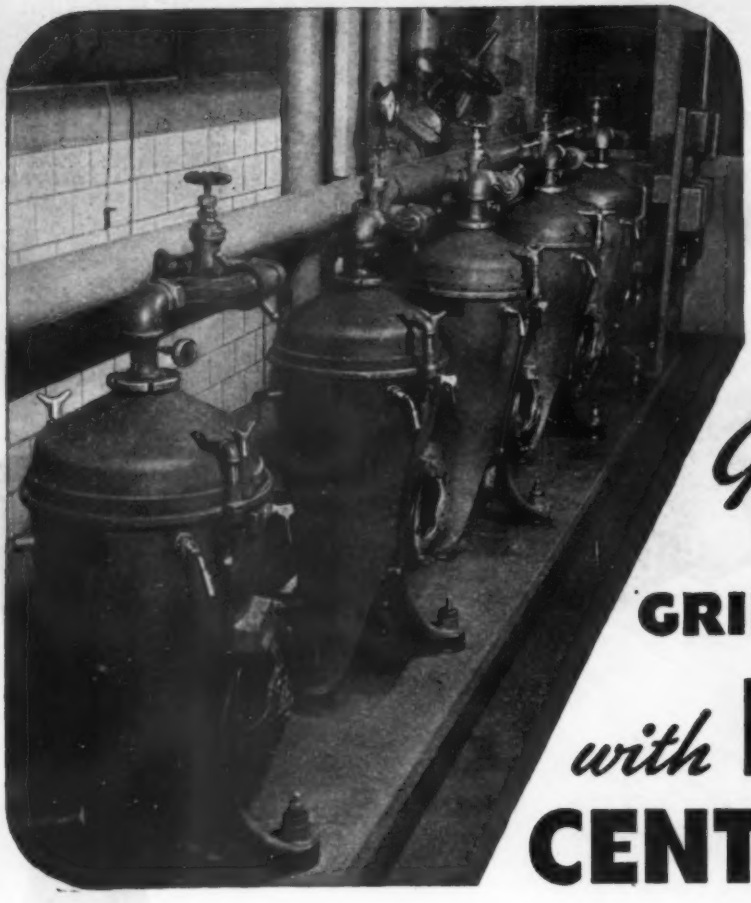
Where increased production, high accuracy, and greater economy through multiple operations are required . . . See Ex-Cell-O First!

To left: A sectional view of one of Ex-Cell-O's precision boring departments where miscellaneous production parts are turned, faced, bored, recessed to accurate measurements.

XLO

EX-CELL-O *for* PRECISION

EX-CELL-O CORPORATION · DETROIT 6, MICH.



Five De Laval "Hermetic" Coolant Clarifiers installed at Thompson Aircraft Products Co., Euclid, Ohio.

FOR BETTER *Ground Finishes...* CLARIFY THE GRINDING COOLANT *with* DE LAVAL CENTRIFUGALS

KEEPING the grinding coolant as clean as possible is a major step in obtaining uniformly good ground finishes at low cost. De Laval Coolant Clarifiers, by means of centrifugal force, remove from coolant the abrasive sediment which tends to impair finishes. Thus their use enables grinding to be done to closer limits, there is less likelihood of distorting the work or starting fatigue cracks, and fast cutting action of the wheels can be maintained over longer periods. Moreover, wheels themselves last longer with fewer dressings required, and the useful life of the coolant is markedly prolonged.

These production advantages and economies resulting from the use of De Laval Coolant Clarifiers are basic, and apply to any factory having a centralized grinding set up, regardless of the size of the plant. The systems are easy to install and operate . . . a De Laval representative will be glad to assist in studying your layout.

● For additional information, write for Bulletin FG-24.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
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De Laval *"Hermetic"* COOLANT CLARIFIERS

FOR GREATER GRINDING EFFICIENCY

"With

Gulf Cut-Aid

we get more production, longer tool life and better threads"—

says this Foreman

"GULF CUT-AID proved superior to several other types of cutting fluids we tested for machining special aluminum alloy screws for aircraft," says this Foreman. "With this fine cutting oil we get greater production, longer tool life, and better threads."

This report is typical of hundreds received from shops that use Gulf Cut-Aid for machining aluminum, aluminum alloys and other nonferrous metals. For this revolutionary new cutting oil consistently shows better results in this type of work!

It will pay every machine shop to learn the full possibilities of Gulf Cut-Aid and other Gulf production-proven cutting oils. Call in a Gulf Service Engineer today and let him show you how they can help you with your machining problems. Write, wire, or phone your nearest Gulf office today.

GULF INDUSTRIAL LUBRICATION

Gulf Quality Cutting Oils

Gulf Lasupar Cutting Oils A, B, and C

Gulf Electro Cutting Oils A, B, and C

Gulf M-L Cutting Oils A, B, and C

Gulf Cut-Aid

Gulf L. S. Cutting Base A and B

Gulf Oil Corporation · Gulf Refining Company
3800 Gulf Building, Pittsburgh 30, Pa.

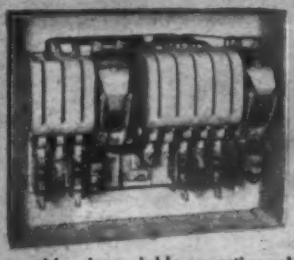
Please send me, without obligation, a copy of the booklet, "Gulf Cutting Oils," which includes a helpful Machining Guide.

Name.....

Company.....

Title.....

Address.....



For frequent starting or remote control. A full-voltage starter for two-speed squirrel-cage motors, and also available for starting three-speed or four-speed squirrel-cage motors. This particular switch provides dependable operation where motors are started frequently, and where remote control is desired—on pumps, blowers, ventilating fans, and machine-tools.

MOTOR STARTERS

EVERY TYPE, EVERY SIZE,

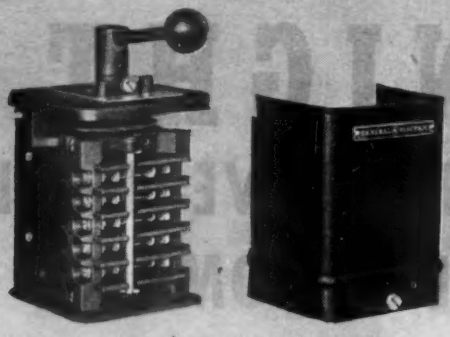
WHY BUY TWO DEVICES WHEN ONE WILL DO THE JOB?

This G-E COMBINATION STARTER gives you in a *single* package both a motor-circuit switch and a magnetic starter.

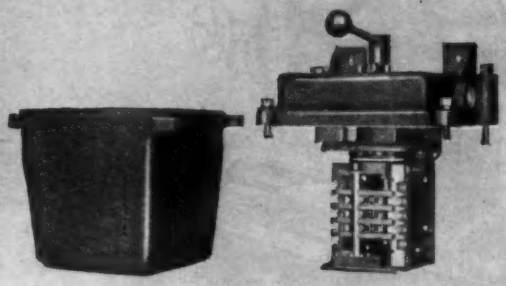
INDUSTRIAL CONTROL

★ DEPENDABLE
★ ATTRACTIVE IN APPEARANCE
★ DESIGNED TO BLEND WITH MODERN MACHINES

For full-voltage starting of squirrel-cage a-c motors



Small size—general purpose. Our small-size switch is cam-operated and spring-return to the off position. This particular device is recommended for single-speed reversing service or for two-speed non-reversing service.



Small size—dust-tight and watertight. The small size, too, comes in a variety of enclosures to meet different operating conditions. An example is this three-pole, reversing, rotating-cam switch in a watertight and dust-tight cast-iron case. It provides one point forward and one point reverse.

FOR EVERY MACHINE APPLICATION

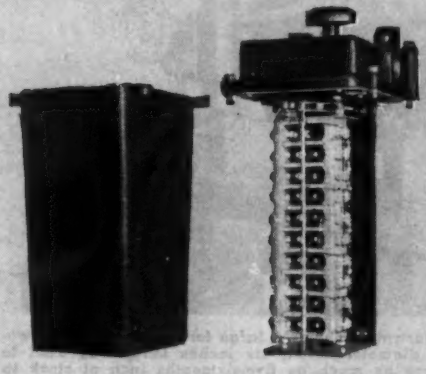
When you need motor starters, be sure to investigate G.E.'s complete line—perhaps some may give you important savings in time, space, or materials.

Take combination starters, for example—because you buy one packaged unit, less time is required for ordering and for installation. You can save space, too, by mounting them in small, unused spaces either near to or remote from the operator. And critical materials are conserved because these starters have less copper wire, steel conduit, and fittings than separately mounted devices.

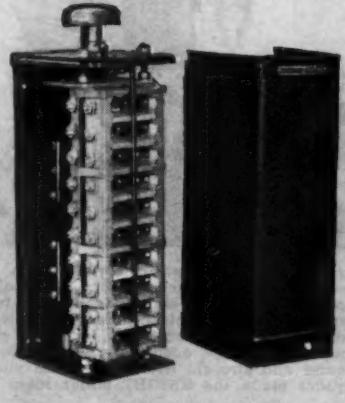
Also shown here are other G-E starters—leaders in their field. They range from a general-purpose type of rotating cam switch to a full-voltage, multispeed magnetic starter. Frequent starting, remote control, different starting speeds, and many other special requirements can be obtained by selecting one of these starters.

And all G-E starters come in a variety of enclosures designed to meet different operating conditions.

We'd like to send you any additional information you may want. And remember, our engineers will be glad to assist you in selecting exactly the right starter for your needs. Get in touch with your local G-E office today. Or if you prefer, write directly to General Electric Company, Schenectady 5, N. Y.



Multispeed—dust-tight and watertight. Rotating-cam switches come in enclosures to meet your needs. Here is a reversing, multispeed, rotating-cam switch in a watertight and dust-tight cast-iron case. This switch provides four speeds forward and one speed reverse.

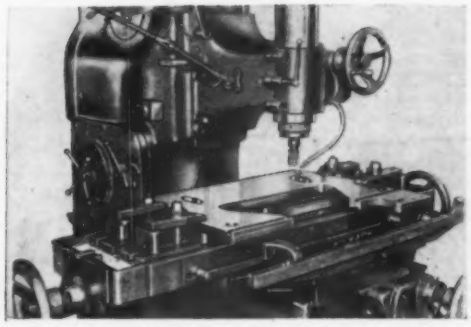


Multispeed—general purpose. This general-purpose type of rotating-cam switch is available for single-, two-, three-, or four-speed motors requiring forward and/or reversing service. Particular care has been taken to assure you of obtaining the long-lived service that you want in a switch.

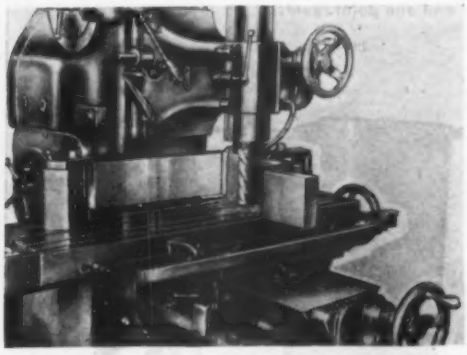
GENERAL ELECTRIC

676-127-4010

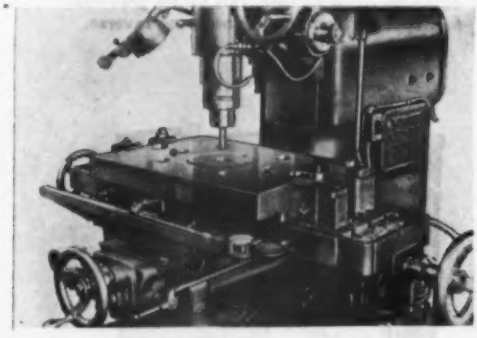
Buy all the BONDS you can—and keep all you buy



• On the large one-inch steel plate, many operations were performed at one setting, including profiling, milling, boring, slotting, and keyway cutting. KNIGHT Miller's wide range of spindle speeds, solid table unit, and ease of handling provided efficient production and accurate results on all of these operations.



• Illustration shows a large forging on which a two-inch diameter cutter, six inches long, was used to remove as much as five-sixteenths inch of stock in some places without appreciable spindle deflection. The forging was machined completely all over and met with rigid inspection for finish and tolerances. A good, stiff job for any vertical miller and the KNIGHT took it.



• Handling a boring job on an eighteen-inch by twenty-nine inch plate, two inches thick. Nine holes, ranging from one and one-eighth inches to two-inches diameter, were accurately bored to limits of plus or minus .0005". Dial indicators for quick and accurate locating, a large accurately fitted spindle to insure round and straight holes, and table slides that are square made the KNIGHT Miller ideal for the job.

KNIGHT

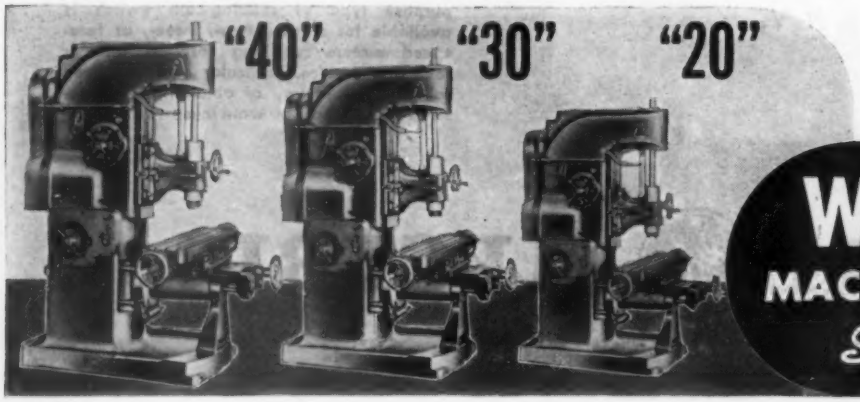
UNIVERSAL VERTICAL MILLERS COMBINE

VERSATILITY
SPEED
ABILITY
RIGIDITY
ACCESSIBILITY
ECONOMY

FOR A WIDE RANGE OF OPERATIONS

Milling . . . Recessing
Boring . . . Shaping
Drilling . . . Routing
Turning . . . Backfacing
Surfacing . . . Slotting
Counterboring . . . Profiling

And you have the advantage of changing quickly from one job to another—at all times you are equipped for unusual capacity. Where speed and convenience are required, KNIGHT Millers deliver—where power and rigidity are required, KNIGHT Millers are fully able and give you more efficient operation, faster manipulation, and quicker set-ups.



KNIGHT VERSATILE MILLERS ACCURATE RIGID

W. B. KNIGHT
MACHINERY COMPANY
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For Your Small Wheel Jobs, Too . . .
Specify "NORTON"
FOR all kinds of internal grinding jobs and other types of small wheel jobs there's a complete line of Norton Grinding Wheels. They are available in Alundum, 19 Alundum, 38 Alundum, 57 Alundum, and Crystolon abrasives, in vitrified, BE vitrified and resinoid bonds. Especially effective on some internal grinding jobs are Norton OPEN STRUCTURE Wheels.
For grinding the carbides, glass, ceramics and similar materials there are Norton Diamond Wheels.
And, of course, there's a complete line of Norton Mounted Wheels.
Your Norton abrasive engineer will be glad to study your small wheel jobs and make specific recommendations. The Norton booklet "The ABC of Internal Grinding" is full of practical information. Write for Form 436 AM.
NORTON COMPANY, WORCESTER, MASS.
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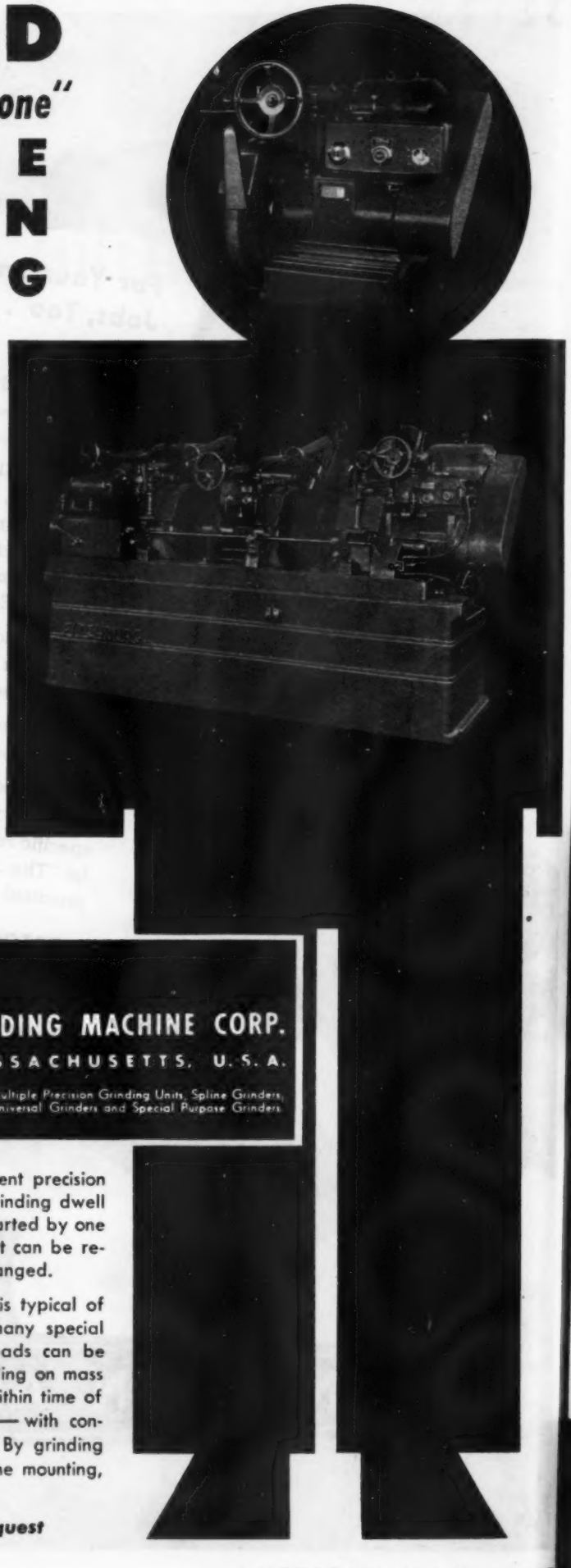
NORTON ABRASIVES

THIS HEAD
PUTS ITS *"Nose to the Grindstone"* FOR MULTIPLE PRECISION GRINDING



To bring precision grinding the advantages which multiple tooling and combined cuts have given machined work in mass production, Fitchburg engineers put their heads together.

The result, the Fitchburg independent standard Bowgage Head, completely self-contained, and enabling one machine to perform as many operations as it has heads with which to grind.

For instance, a machine can be arranged for plunge-cut grinding one end and the second head set up for hydraulic traversing for longitudinal grinding, while the number three head is also plunge-cut grinding the other end. This is advantageous on gun barrels or long spindle type pieces where three operations are necessary — and all three operations will be performed within the time of the longest single operation!

If you have an "axe to grind" with your current production speeds and costs, let Fitchburg engineers show you how the Fitchburg method can be applied to your special problem. No obligation. Write today !

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.
Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *The Fitchburg Triple-Head Machine* illustrated is typical of the functional engineering and rugged construction of many special machines into which independent Fitchburg Bowgage Heads can be built to cut costs through multiple automatic precision grinding on mass production. It grinds three dimensions at the same time, within time of longest single grinding operation, and in one handling — with consequent saving in time and reduced danger of spoilage. By grinding several dimensions automatically on the same piece, at one mounting, it releases operator for other work.

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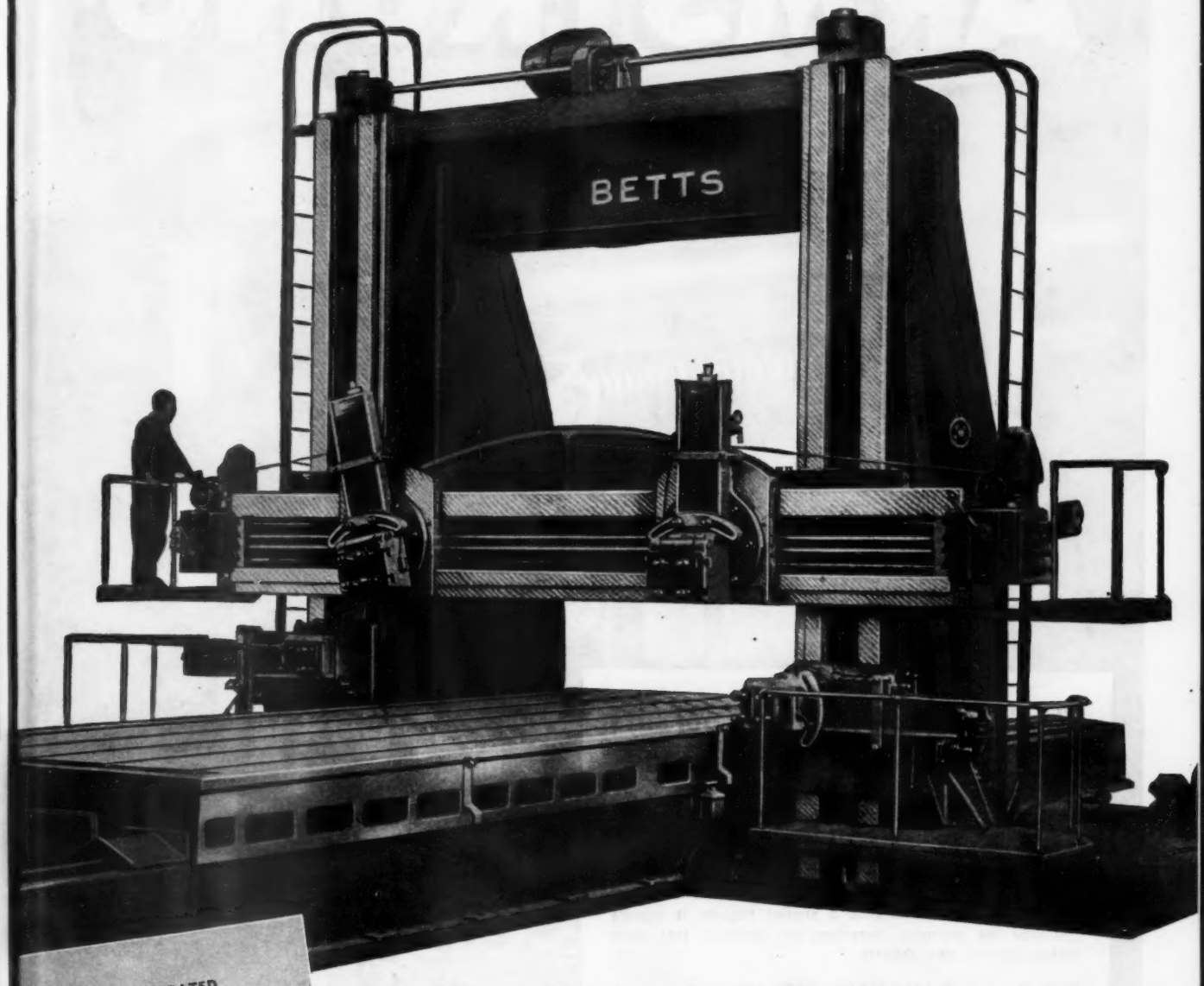
BETTS HEAVY DUTY PLANERS

For Speed, Accuracy and Economy



CONSOLIDATED HEAVY DUTY MACHINE TOOLS INCLUDE....

LATHES
BORING MILLS
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PLANERS
SLOTTERS
SPECIAL MACHINES
RAILROAD SHOP TOOLS

BETTS 11'-6"x11'-6" HEAVY DUTY PLANER

This machine is designed with three bed ways for even load distribution when machining especially heavy work. Variable voltage planer drive provides smooth accurate operation in a wide speed range. Soundly engineered design insures long dependable service combined with operational economy, safety and convenience.

BUILDERS OF HEAVY DUTY PLANERS SINCE 1861

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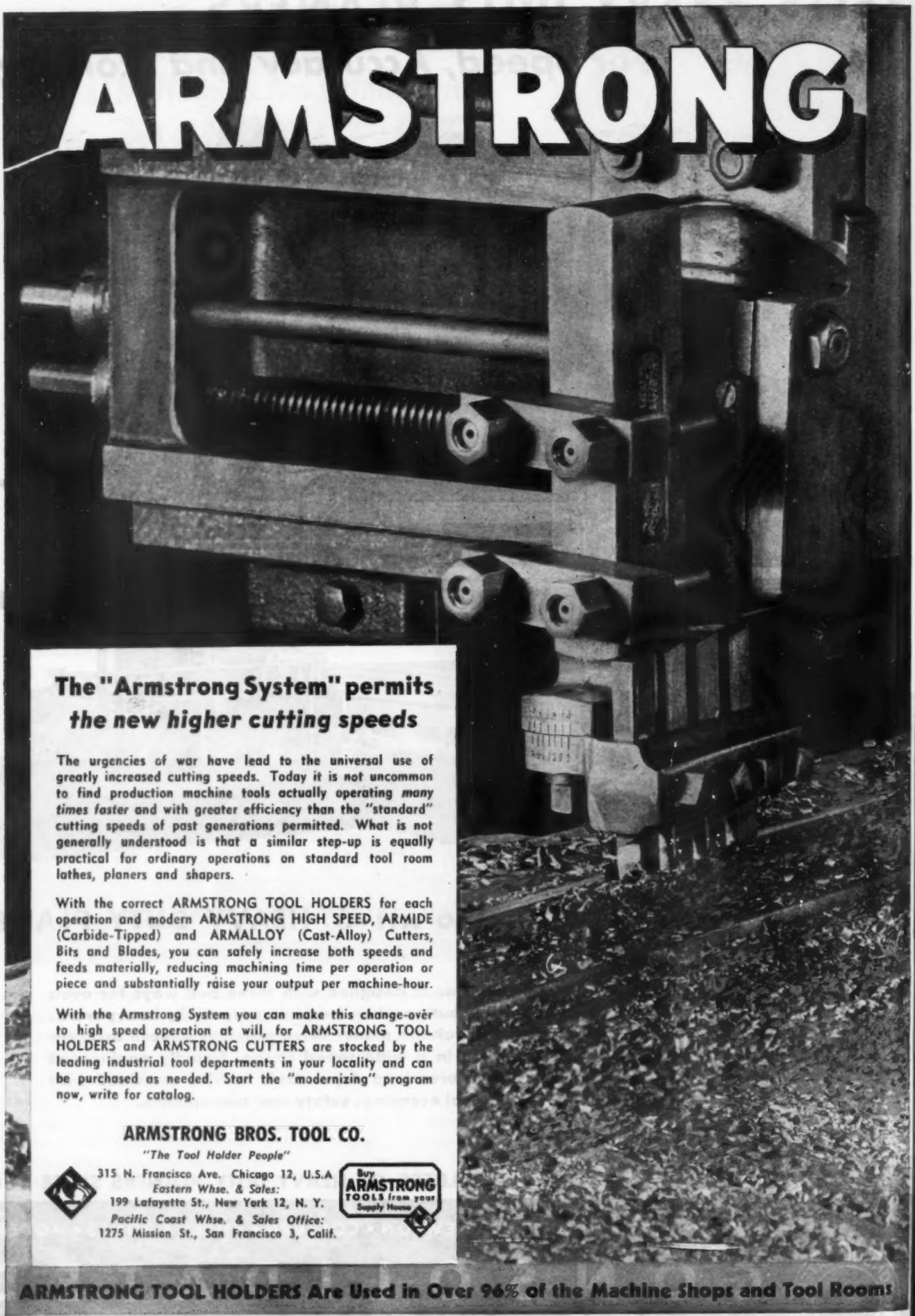
CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

ARMSTRONG



The "Armstrong System" permits *the new higher cutting speeds*

The urgencies of war have lead to the universal use of greatly increased cutting speeds. Today it is not uncommon to find production machine tools actually operating *many times faster* and with greater efficiency than the "standard" cutting speeds of past generations permitted. What is not generally understood is that a similar step-up is equally practical for ordinary operations on standard tool room lathes, planers and shapers.

With the correct ARMSTRONG TOOL HOLDERS for each operation and modern ARMSTRONG HIGH SPEED, ARMIDE (Carbide-Tipped) and ARMALLOY (Cast-Alloy) Cutters, Bits and Blades, you can safely increase both speeds and feeds materially, reducing machining time per operation or piece and substantially raise your output per machine-hour.

With the Armstrong System you can make this change-over to high speed operation at will, for ARMSTRONG TOOL HOLDERS and ARMSTRONG CUTTERS are stocked by the leading industrial tool departments in your locality and can be purchased as needed. Start the "modernizing" program now, write for catalog.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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Eastern Whse. & Sales:
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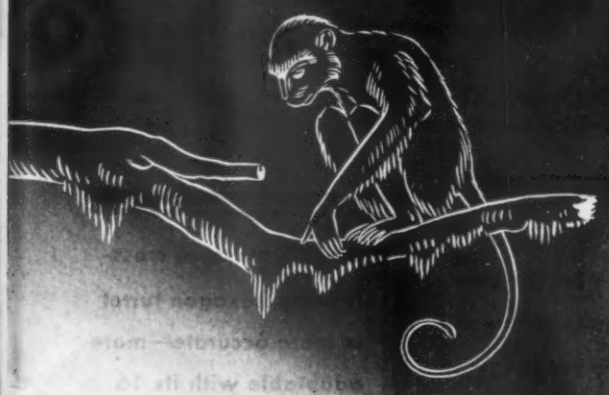
Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

Nicknamed "THE MONKEY"

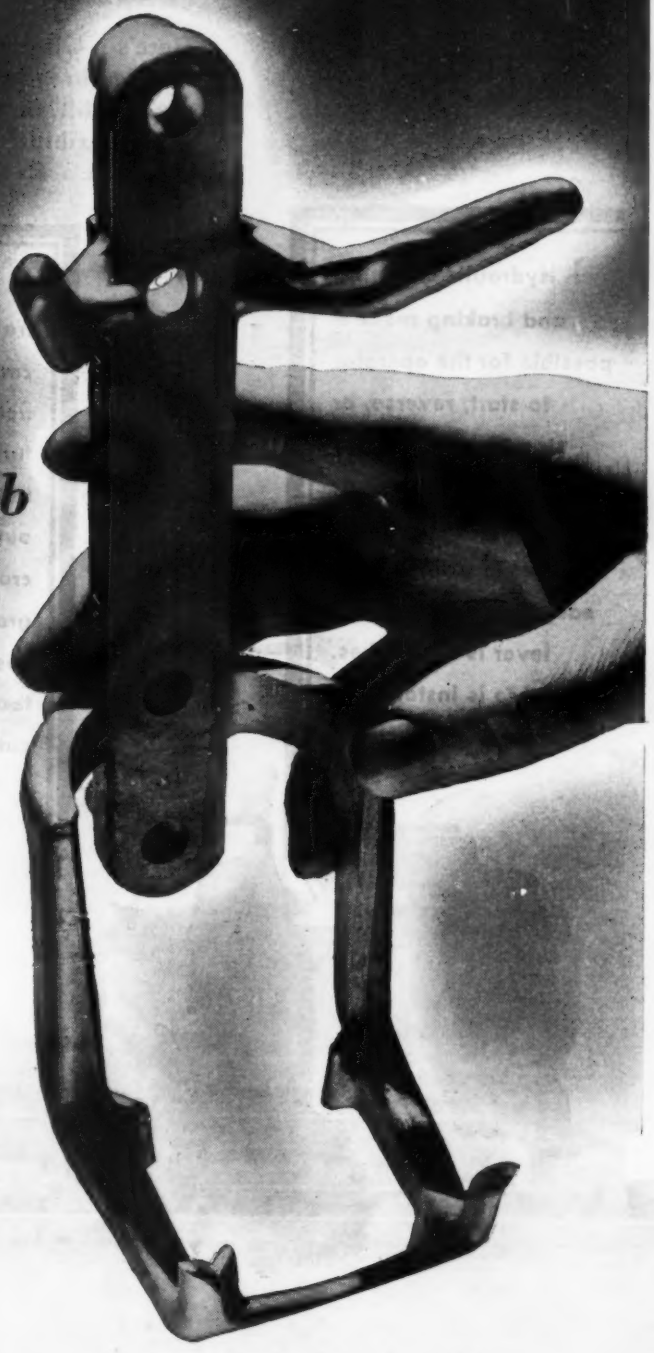


but doing a man-size job

Clutching a paper milk carton in his arms, this monkey-like die casting must be a rugged little devil to hold its dimensions while diving in and out of a hot paraffin bath. He's made of aluminum. Quick temperature changes in the paraffining operation won't affect his size or shape. He holds his grip on things . . . hot or cold.

Die cast by Alcoa to close tolerances, this grotesque piece would be extremely expensive to produce by any other method of fabrication. With very little machining, it is ready to go right to work.

As you plan new products, consider light metal die castings right from the start. Your designs may be simpler, production less of a problem. Alcoa will gladly help you determine the facts. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pa.



This Alcoa Aluminum die casting is used by American Can Company in half pint, pint and quart sizes.

FIRST IN ALUMINUM

ALCOA

ALCOA ALUMINUM

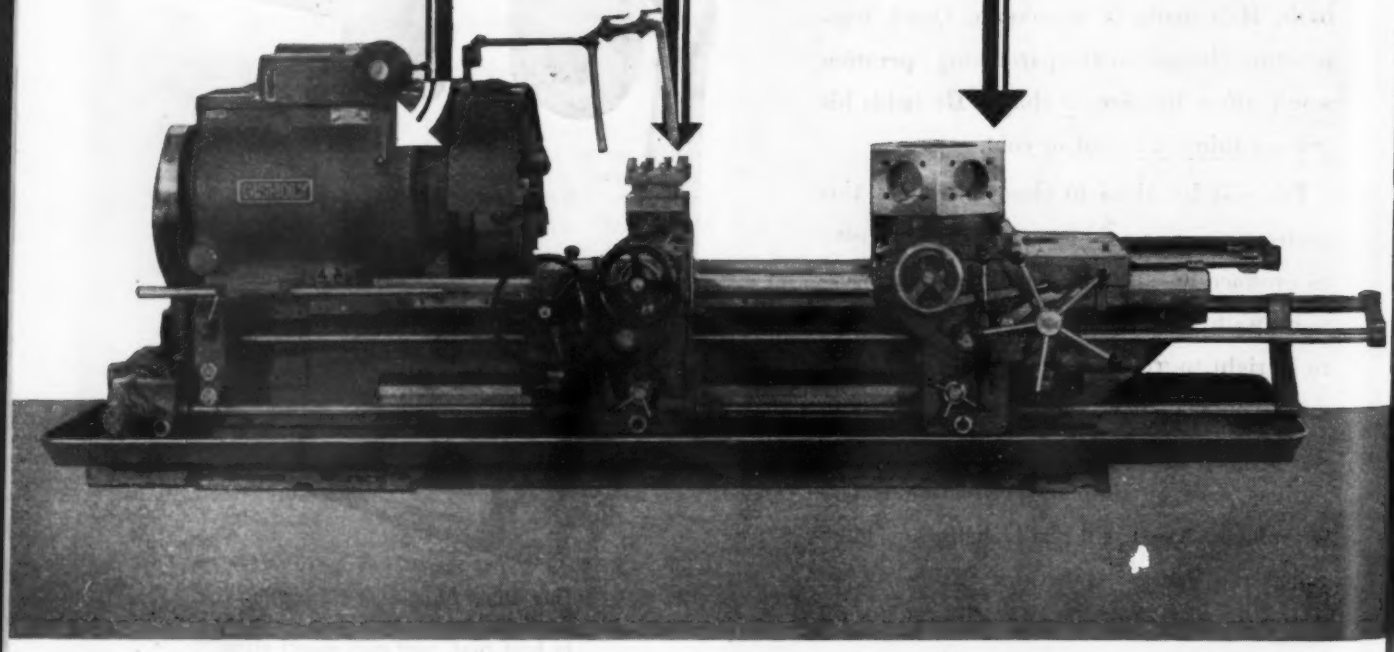
Adaptable . . .

Here's a Gisholt advantage that pays big dividends . . . the ability to handle a broader range of work when the need arises. Take, for example, the Gisholt 4L Saddle Type Turret Lathe. A big machine, to be sure, yet its flexibility and ease of operation enable it to handle smaller work too. Here are a few of the reasons why:

1 Hydraulic clutching and braking make it possible for the operator to start, reverse, or stop the spindle—as quickly and as effortlessly as on many smaller machines. One easy movement of one lever is all it takes. Response is instantaneous, smooth, positive.

2 Power rapid traverse for the side carriage is provided not only for longitudinal movement but also for in-and-out movement of the cross slide. Here's greater ease and speed for bringing tools quickly into cutting position.

3 This massive cross-feeding hexagon turret is more accurate—more adaptable with its 16 reversible feeds and automatic feed trips for both longitudinal and cross feeds. It can be locked rigidly on center for bar work—or chucking work with piloted tools.



Adaptability is a fact that applies to both Gisholt Saddle Type and Gisholt Ram Type Turret Lathes. Make the most of it. Explore the possibilities of each type to assure the most flexible and economical set-up for your own production. Ask for literature.

GISHOLT MACHINE COMPANY • *1201 E. Washington Ave., Madison 3, Wis.*

Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

What does it take to make a war?

It takes more than a toothbrush mustache, an upraised arm, a symbol on a flag.

And it takes more than guns and tanks and planes.

It takes ignorance, intolerance and want. . . . The psychopathic mire that breeds little conquerors, and the political softness that makes nations look the other way.

But what does it take to *prevent* a war?

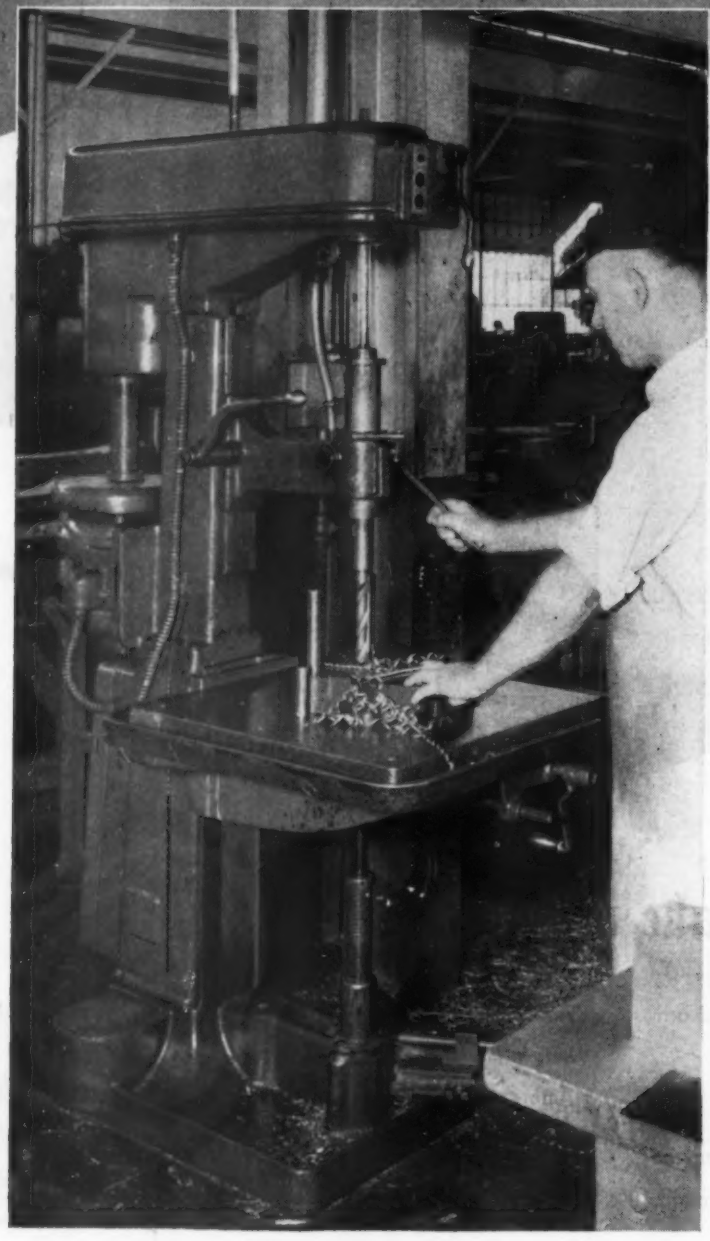
It takes knowledge, communication, and freedom of thought. . . . Economic opportunity, and productive power.

And it takes a strong police force to keep the rough neighbors kids in line and slap the gangsters down.

America lacked what it takes to *make* a war. But we have what it takes to win one . . . and to *prevent* one in the future. Today, the engineers of the basic machine tool producers stand ready to help the men of government and of industry in their postwar planning for a strong America — a nation powerful enough to prevent future wars with the strength of a healthy economy here at home, and the best equipped military police force the world has ever seen.

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

For high speed small hole drilling
FOSDICK *High Speed* DRILLS



● On work requiring holes up to 1¼ inch diameter Fosdick High Speed Drills are meeting an unusually wide range of drilling needs.

In tool and die shops—in production plants—in machine tool plants these sturdy high speed drills are meeting a specific need for accuracy and high production.

Illustrated is one at the Faigle Tool and Die Works where it handles a variety of different drilling operations on tool and die work. The wide range of speeds available—the ease with which they can be changed—and the simplicity of operation make them particularly desirable for tool and die shops.

The machines are furnished in single spindle or up to six spindles with variations in base dimensions to meet work requirements.

Complete information on the various combinations is available in the Fosdick High Speed Drill Bulletin H. S. A.

★

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

SIDNEY *Tool Room* LATHES

for your Precision Work

SIDNEY COMPOUND REST

The cross feed and compound screw are furnished with adjustable nuts and tapered gibs to compensate for backlash and wear—both are equipped with large micrometer dials. A micrometer stop on the cross feed provides an adjustable depth stop for turning or threading—and for internal and external thread chasing.

● Illustrated is a Sidney Tool Room Lathe machining close tolerance parts for aircraft.

The Sidney Tool Room Lathe is a well balanced precision tool designed with sufficient metal and proper distribution to assure rigidity and continued accuracy.

The continuous tooth Herringbone geared head not only provides a smooth flow of power but reduces backlash to practically nothing and assures smooth finish and accuracy. Centralized controls make for easy operation.

Its versatility and sturdy construction combine to give you dependable precision on a wide range of work.

Bulletins on all sizes available.

The
SIDNEY
MACHINE TOOL COMPANY
Builders of Precision Machinery
SIDNEY • OHIO
ESTABLISHED 1904

You'll get better hole finish with Staples Expansion Reamers because they are easily adjusted to .0001 inch; and longer tool life because they can be expanded several times without a regrind.

You'll get lower production costs, too, because of more accurate reaming, more reamed holes per grind.

The tool body of the Staples Expansion Reamer is solid—not slotted or split. This provides rigidity and accuracy. To expand, simply drive in the plug. Expansion is accurate and uniform. Cutting blades remain perfectly concentric.

Made originally to meet the precision standards of the aircraft industry, Staples Tools are now available for general use in the metalworking industry. Send today for the Staples catalog of quality cutting tools, including *standard tools available from stock.*

Staples Tool & Engineering Company
Cincinnati 25 . . . . . Ohio

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

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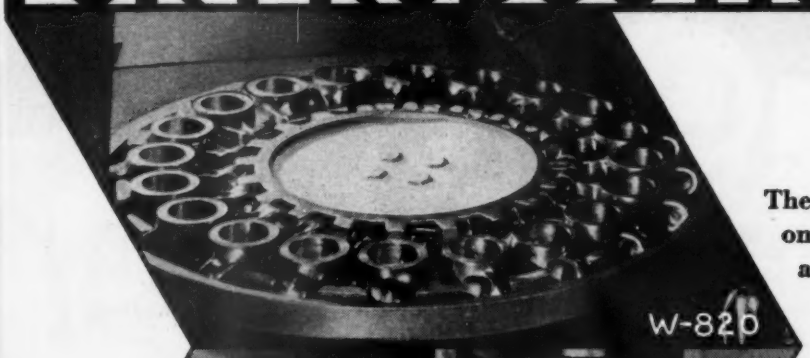
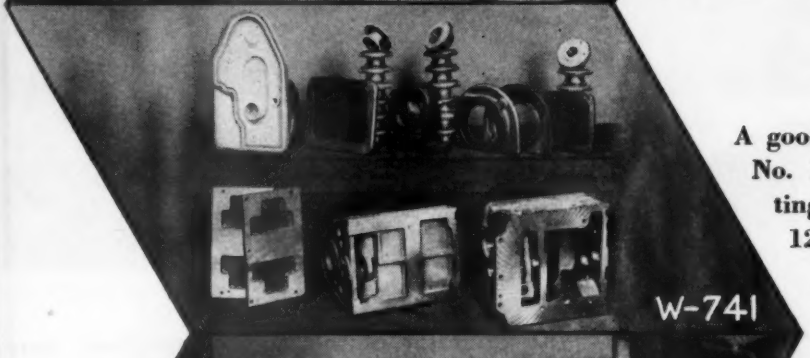
Toledo, Mill & Factory Supply
Tulsa, Marshall Supply & Equipment
Waterbury, White Supply
Waterville, Harold W. Kimball

FOR PRODUCTION PUT IT ON THE BLANCHARD

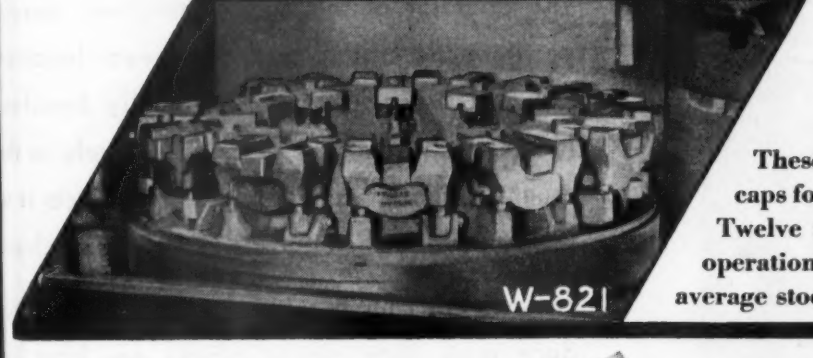


These steel forged rocker arms are ground on a No. 11 Blanchard Surface Grinder and 1800-2000 pieces are produced per eight hour shift, stock removal .005" to commercial limits.

One of many airplane engine parts ground on the No. 18 Blanchard Surface Grinder. 109 of these nickel steel cams are produced per hour, stock removal .040" to .060", to ± .001".



A good example of the way Blanchard No. 18 Surface Grinders are eliminating hand scraping. Fifteen Gear boxes 12" x 12" x 3" or 30 surfaces are ground per hour, removing .070" each side for oil-tight joints.



These nickel steel forgings are bearing caps for the master rods of radial engines. Twelve of these caps are ground in one operation requiring only 27 minutes, average stock removal .075".

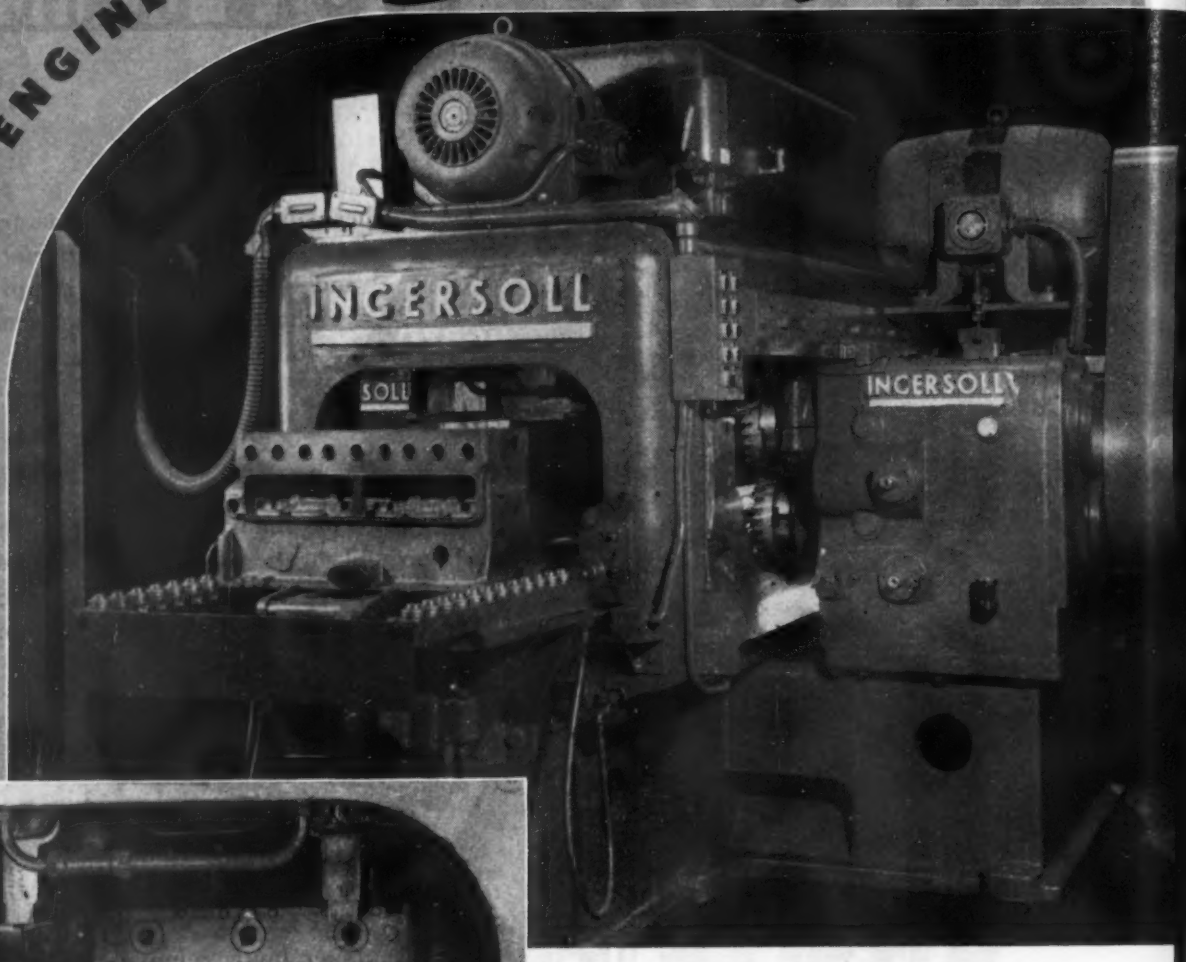
Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

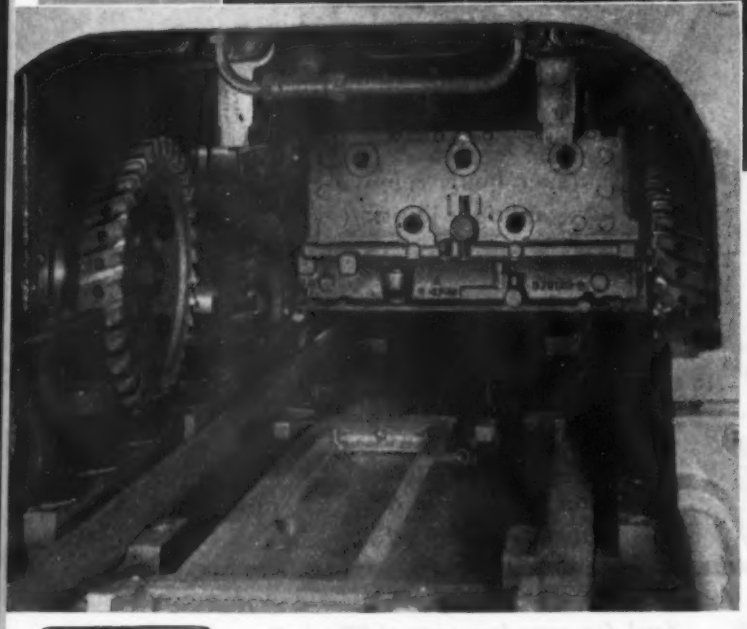
BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

MILLING ENGINE BLOCKS 3 times faster





Five Spindles rough and finish mill both ends of the cylinder block.

The operator of this special machine merely positions the casting at the conveyor location shown. The machine automatically transfers, locates and clamps the block successively in the roughing and finishing stations, and ejects it to the conveyor at the opposite end of the machine.

Faster feeds plus this automatic handling produce more than ninety blocks per hour — equivalent to three manually loaded machines, previously used.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

INGERSOLL

SPECIALIZED MILLING, DRILLING, BORING, TAPPING, SCALPING MACHINES

A few simple rules to conserve carbide tools

FIRTHITE FIELD SERVICE POSTERS are available for display in your plant

The conservation of carbide tools through proper handling and correct usage is essential not only in war time but at any time for best production results and low operating costs.

These Firthite field service posters will help remind your plant operators in simple, easy-to-take, understandable manner, of the right way to make carbide tools do their utmost.

Fill in and mail the coupon for your set of these free, 17" x 22", four-color posters.

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FIRTH-STERLING STEEL CO., Dept. AM—McKeesport, Pa.

Please send us without obligation on our part_____sets of Firthite Field Service Posters which we wish to display in our plant shops.

NAME_____ TITLE_____

COMPANY_____

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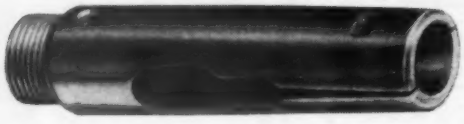
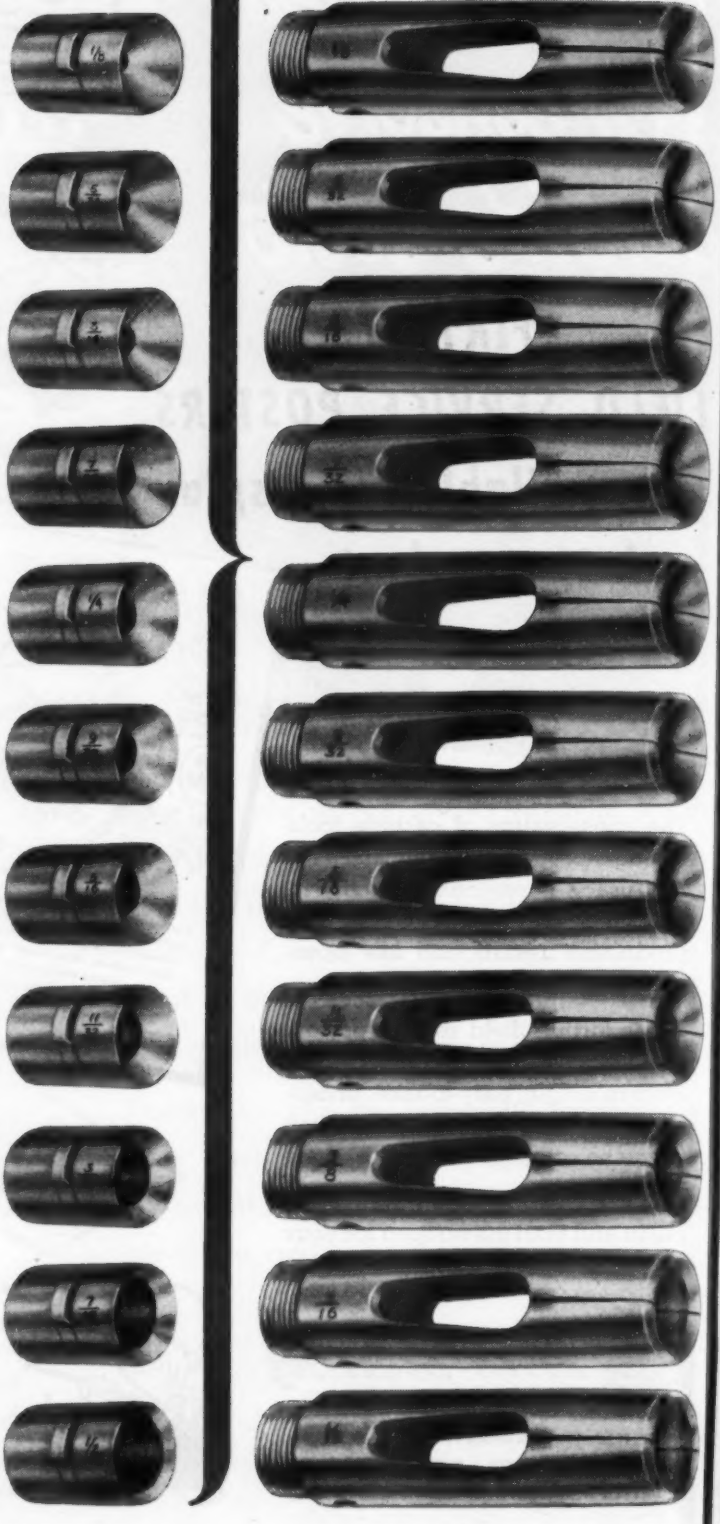
ONLY 1
HARDINGE
Style "B" Master Feed Finger
with interchangeable pads saves ALL this





THE illustrations graphically show the material saved when a HARDINGE Style "B" Master Feed Finger and interchangeable Pads are used instead of conventional solid feed fingers. Although this saving has been going on in screw machine departments using Style "B" since 1928, it is now more important than ever before as the economy not only saves money for you, but also conserves steel which is of vital importance today.

This saving is apparent to you. The many other advantages of using HARDINGE Style "B" Master Feed Fingers with either steel, bronze or nickel cast iron pads will be immediately appreciated when you put them into use. Learn these advantages by asking for your copy of the bulletin illustrated below.

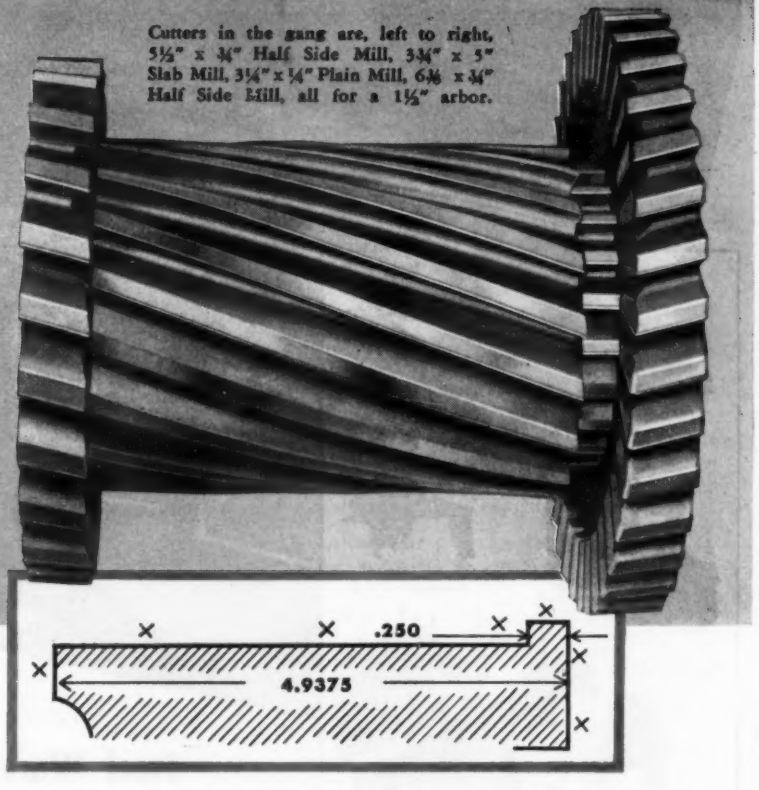
HARDINGE BROTHERS, Inc.
ELMIRA, N. Y

Ask for this bulletin

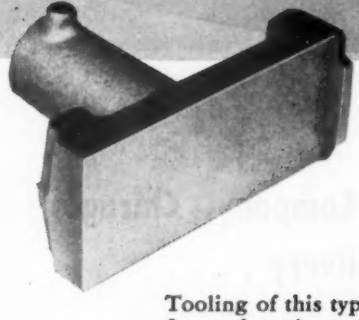
Every screw machine department should have the complete information given in this bulletin. Available to purchasing agents, superintendents, foremen, engineers, set-up men and operators in organizations which have a screw machine department.

BARBER-COLMAN
ENGINEERED
MILLING CUTTERS

GANG OF FOUR PROFILE TYPE CUTTERS DOES A GOOD PRODUCTION JOB ON TOUGH STEEL FORGINGS



Cutters in the gang are, left to right, 5½" x ¾" Half Side Mill, 3¾" x 5" Slab Mill, 3¼" x ¼" Plain Mill, 6⅜ x ¾" Half Side Mill, all for a 1½" arbor.



Tooling of this type, which is finishing five surfaces in one pass, often makes it possible to save one or more operations. In this particular case, where the surfaces are all in the same plane and at right angles to each other, standard types of cutters are used with only slight modifications. By choosing the proper feeds and speeds for a suitable cutting rate and chip load per tooth, the desired finish is obtained.

SHARPENED OFTEN FOR LONGER CUTTER LIFE

This back plate job is set up for special two-station milling on a standard heavy duty milling machine. Two pieces are clamped in each station so one set is cutting while the other is being loaded. Also, one set is milled conventionally and the other with a climb cut. Stock removed is 1/16" with a feed of 2¼" per minute and an average of 62½ surface feet per minute, which gives a chip load of .00125" per tooth and a production of 36 pieces per hour. This gang of cutters is sharpened every 275 pieces. Actually, customer found they would deliver more pieces per grind, but at the expense of fewer sharpenings and substantially shorter cutter life in terms of total pieces produced.

PLANNED BY BARBER-COLMAN CUTTER ENGINEERING SERVICE

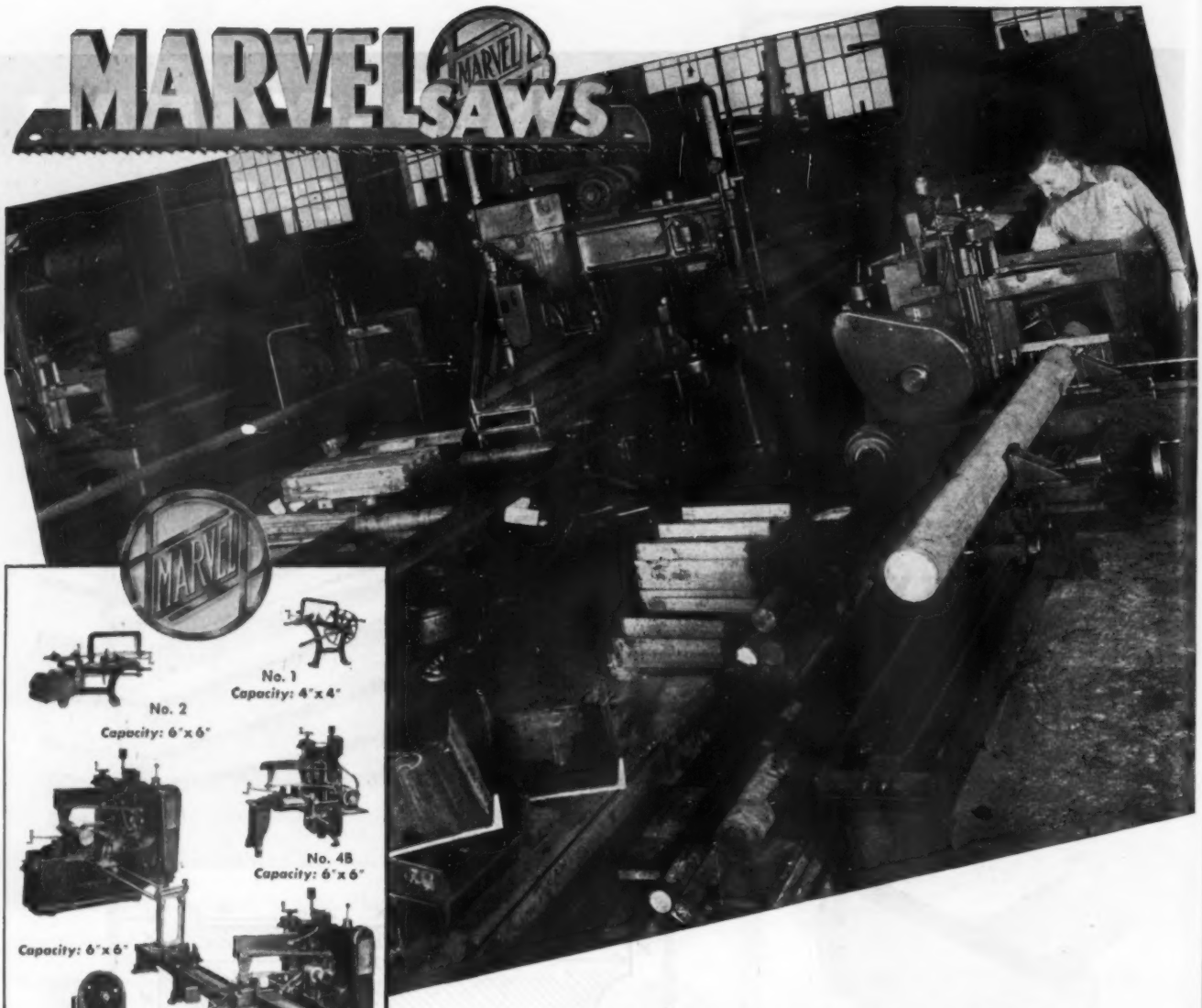
Oustanding results were obtained on this job through careful collaboration of the customer, the milling machine manufacturer and Barber-Colman Milling Cutter Engineers. With complete information available, these engineers were able to evaluate all of the factors, and apply recommendations which were simple, inexpensive, and economical. The service of Barber-Colman Cutter Engineers is available for solution of your milling problems — send us your data and let us make a recommendation and quotation.

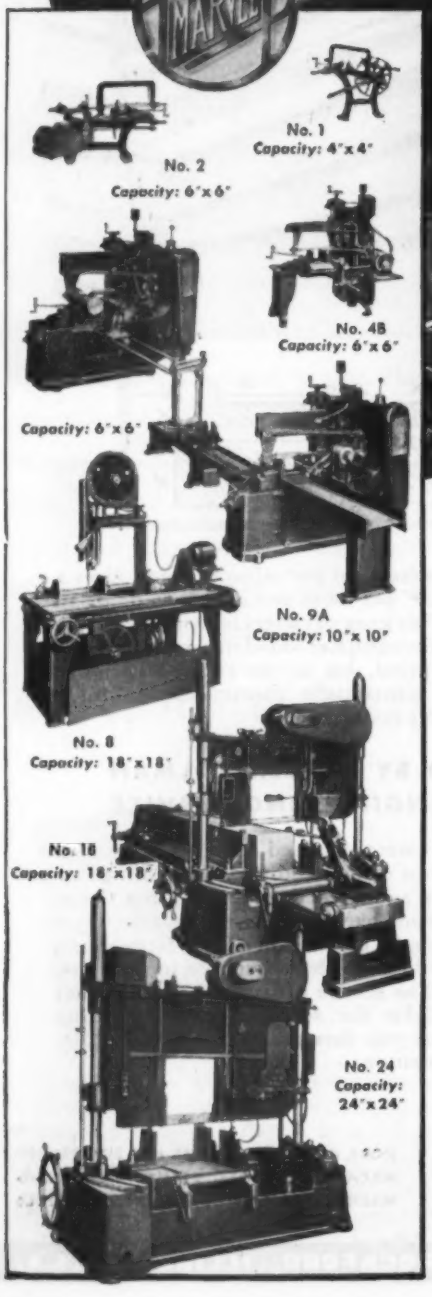
BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

MARVEL SAWS





Steel Warehousing Company, Chicago, features Prompt delivery . . . .

Pieces or lengths cut from bars, tubes or structural shapes can be delivered promptly by this steel warehouse, because they have the MARVEL Saws to handle any cut-off job. Three No. 9A MARVEL Automatic Bar Feed Saws (capacity 10" x 10") which automatically feed, measure and cut-off identical lengths or slices (as gear blanks) from single or nested bars at terrific speed. The fastest hack saws built—these automatic saws require no more operator attention than an automatic screw machine. They are extremely accurate, too, and can be stopped any time in a quantity run, a miscellaneous cut made, and automatic operation resumed by simply re-engaging the bar push-up.

Structural shapes up to 18" and large bars of equal diameters are saw-cut on the No. 18 MARVEL universal Roll Stroke Hack Saws. Cuts are accurately "square" and clean with practically no burrs. This modern saw which is completely armoured to stand the rough handling unavoidable where large work is done, introduces the new roll-stroke principle which enables it to cut-off the toughest steel in the largest sizes rapidly and with extremely long blade life.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE **CHICAGO 39, U. S. A.**

Eastern Sales Office: 225 LAFAYETTE ST., NEW YORK 12, NEW YORK

Heavier DRAWS . . . *Less* SCRAP

. . . *Longer* DIE LIFE!

Quaker Research, *plus* new type raw materials, produce *sensational* new

QUAKER DRAWS

IF QUAKER research chemists and engineers had been content to employ only *conventional* types of raw materials in developing drawing compounds, the metal industries would not now be enjoying the superior performance of modern QUAKER DRAWS.

For example, the newest QUAKER DRAW —#140—contains a *new type pigment.* This so effectively cushions and lubricates the die that heavier-than-ever work can be handled. . . with far less scrap . . . with much longer die life.

Mixed with from 2 to 8 parts water, QUAKER DRAW #140 makes an excellent all-purpose die lubricant that is easy to mix and pleasant to handle . . . provides very effective protection against rust when left on drawn parts . . . and can be removed in an alkaline bath, even after long storage.

Another Quaker development, especially advantageous in forming parts to be porcelain enameled, is QUAKER DRAW #4-60. This compound completely *burns off* when drawn parts are welded and greatly reduces the amount of metal finishing required. Other new Quaker compounds give exceptional results on *stainless steel* and *aluminum.*

QUAKER DRAWS are now helping plane and armament manufacturers set new records in production . . . in die life . . . and in reduction of scrap. Tomorrow, these same manufacturing economies can help your peacetime products meet and beat competition!

A Quaker Process Engineer will gladly work with you now to obtain the maximum advantages which these new compounds make possible!

QUAKER CHEMICAL PRODUCTS CORP.

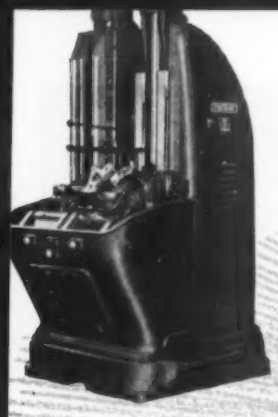
CONSHOHOCKEN, PA.

Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name_____ Position_____

•••PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW•••



Surface Broaching

FOR AUTOMOTIVE PRODUCTION

IN the automotive field Footburt Surface Broaching Machines are used for machining a wide variety of large quantity items. Bearing caps, connecting rods and caps and other parts that must be held to close limits are being surface broached at remarkably high production rates. On parts such as spark plug bodies and spring shackles the parts are indexed during the broaching operation so that the work is completed with one clamping in the fixture. There are still many places where contracts can be speeded up now and there are countless parts that need the benefits of surface broaching in the competitive days ahead. May we discuss with you the possibility of applying surface broaching to your product?

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building

Footburt Patented Tooth Fo

FOOTBURT *Surface Broaching*

KEMPSMITH
A Famous Name
ON INDUSTRY'S "GAY WHITE WAY"
Tonight, lights will be shining brightly in thousands of industrial plants all over the nation. Forced to operate on strenuous 24-hour production schedules, these plants are doing their share to help speed Victory. In many of them, Kempsmith Milling Machines are playing an important role. Dependable Kempsmith machines, with a rich heritage of more than a half-century of milling machinery experience, are built to take today's strenuous schedules in stride. For sheer ruggedness, power and accuracy, you just can't beat a Kempsmith Miller.
At present, the demand for Kempsmith Milling Machines and Attachments greatly exceeds the supply. However, if you need equipment of this type, write us. We'll do the best we can to take care of your requirements.
THE KEMPSMITH MACHINE CO.
MILWAUKEE 14, WISCONSIN, U. S. A.
★ Precision Built Milling Machines Since 1888 ★

now your Big drives

NEW 2000-hp INDUCTION MOTOR LARGEST MEMBER OF TRI-CLAD FAMILY

Dwarfing the original Tri-Clad motor (resting on the conduit box) in size, this new 2000-hp "big brother" embodies all the same protective construction features.

It operates at 1800 rpm, on 2300 volts, 60 cycles. This new 3-phase motor is in the 6360-frame series, which is five steps larger than the largest standard industry frame size (namely 505).

*THE EXTRA TRI/CLAD

REG. U.S. PAT. OFF.

Special motors can be custom built in Tri-Clad design for *your* problem

Your exceptional drive requirements may call for an induction motor specially designed to the job. Whatever its rating, it can generally be built with many of the Tri-Clad motor's strong points, such as enclosed upper portion, smooth cast-iron end shields, windings of Formex wire, and double-end ventilation.

General Electric's special motor engineering has produced the world's fastest motor, the world's strongest motor, and many other tradition-breaking designs. We'll welcome your unusual problems.

HERE'S TODAY'S WIDER RANGE OF STANDARD SIZES	
TRI/CLAD **Type K**	1 hp to 2000 hp at 1800 rpm
TRI/CLAD **Type KG** (High starting torque, low starting current)	5 hp to 200 hp at 1800 rpm
TRI/CLAD **Type KR** (High starting torque, high slip)	Available to 100 hp in speeds required for high-slip flywheel drive (punch press, etc.)

TRI/CLAD MOTORS

Buy all the BONDS you can—*and keep all you buy*

*can have it,** too

PROTECTION OF CONSTRUCTION

G-E STANDARD Tri-Clad Induction Motors Now Available to 2000 hp

For that important *big* drive (up to 2000 hp, 1800 rpm) you can now get a G-E standard Tri-Clad induction motor. All the protective features that have proved so valuable to service continuity and long life in the more widely used sizes are included:

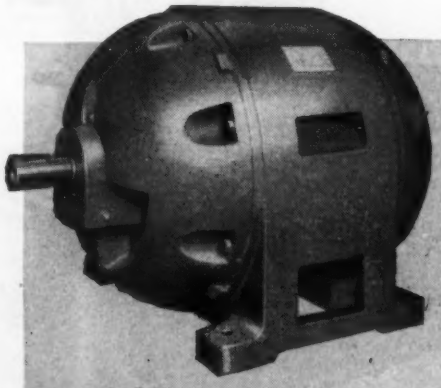
EXTRA PROTECTION FROM PHYSICAL DAMAGE—Cast-iron construction with upper portion completely enclosed to keep out falling objects, dripping liquids. Streamline, cast-iron end shields. Corrosion-resisting finish.

EXTRA PROTECTION FROM ELECTRICAL BREAKDOWN—Windings of Formex* wire are solidly bonded with synthetic resins strongly resistant to heat, oil, and moisture. Formex wire insulation stands up strongly under abrasion or "heat-shock."

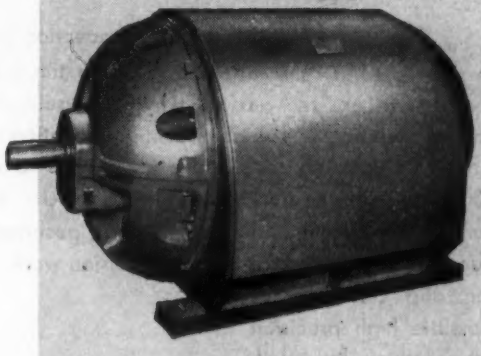
EXTRA PROTECTION FROM OPERATING WEAR AND TEAR—Available with either sleeve or ball bearings—in dust-tight housings. Sleeve-bearing design is a further refinement of well-proved Tri-Clad motor bearing proportions, efficiently lubricated, with "air seal" to insure oil tightness of the housing.

The Tri-Clad, in its wide range of types and sizes, is G.E.'s most widely used (integral-hp) motor. Chances are that there's a Tri-Clad to meet your requirements "on the nose." For information on General Electric's complete line of Tri-Clad motors, ask for GEA-3580. *General Electric Company, Schenectady 5, N. Y.*

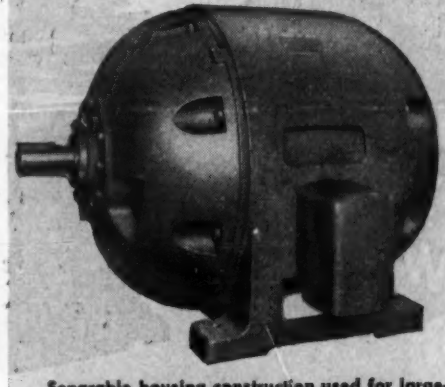
*Trade-mark reg. U.S. Pat. Off.



Typical large-size sleeve-bearing Tri-Clad polyphase motor, now standard up to 2000 horsepower.

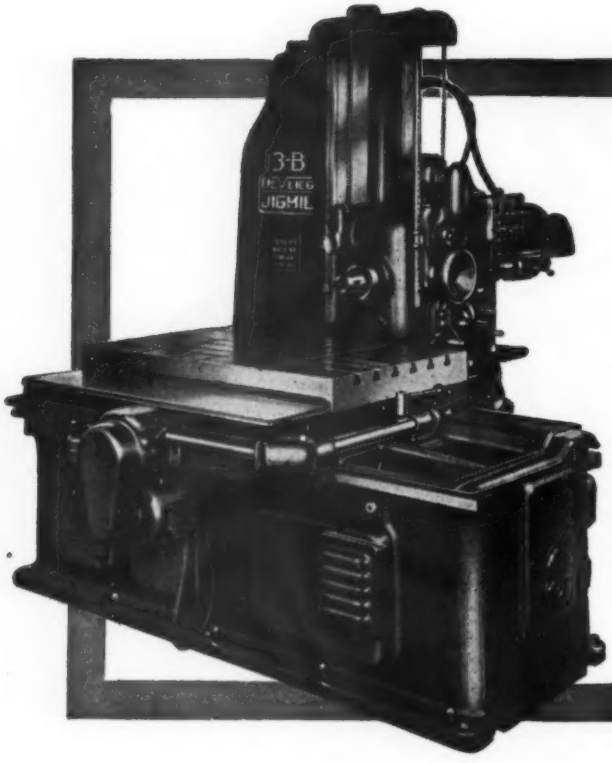


Modified cast-iron frame construction used for certain large sizes of the extended Tri-Clad motor line.



Separable housing construction used for large-size ball- or roller-bearing Tri-Clad motors. Roller bearings are standard at coupling end.

GENERAL ELECTRIC



★

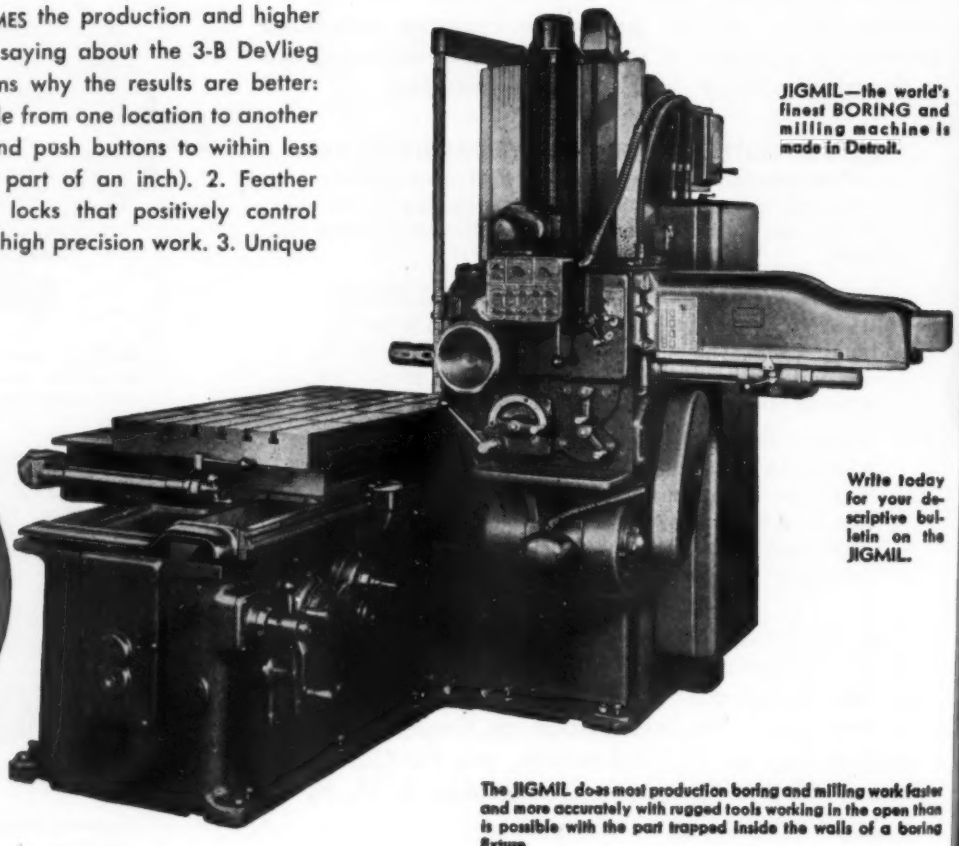
The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling . . .

★

"TWO TO THREE TIMES the production and higher quality work" is what users are saying about the 3-B DeVlieg JIGMIL—and here are the reasons why the results are better: 1. Automatic positioning of spindle from one location to another in response to measuring rods and push buttons to within less than .0001 (one ten-thousandth part of an inch). 2. Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work. 3. Unique operation and controls that make possible high precision work with relatively little skill.

JIGMIL—the world's finest BORING and milling machine is made in Detroit.

JIGMIL YOUR WORK

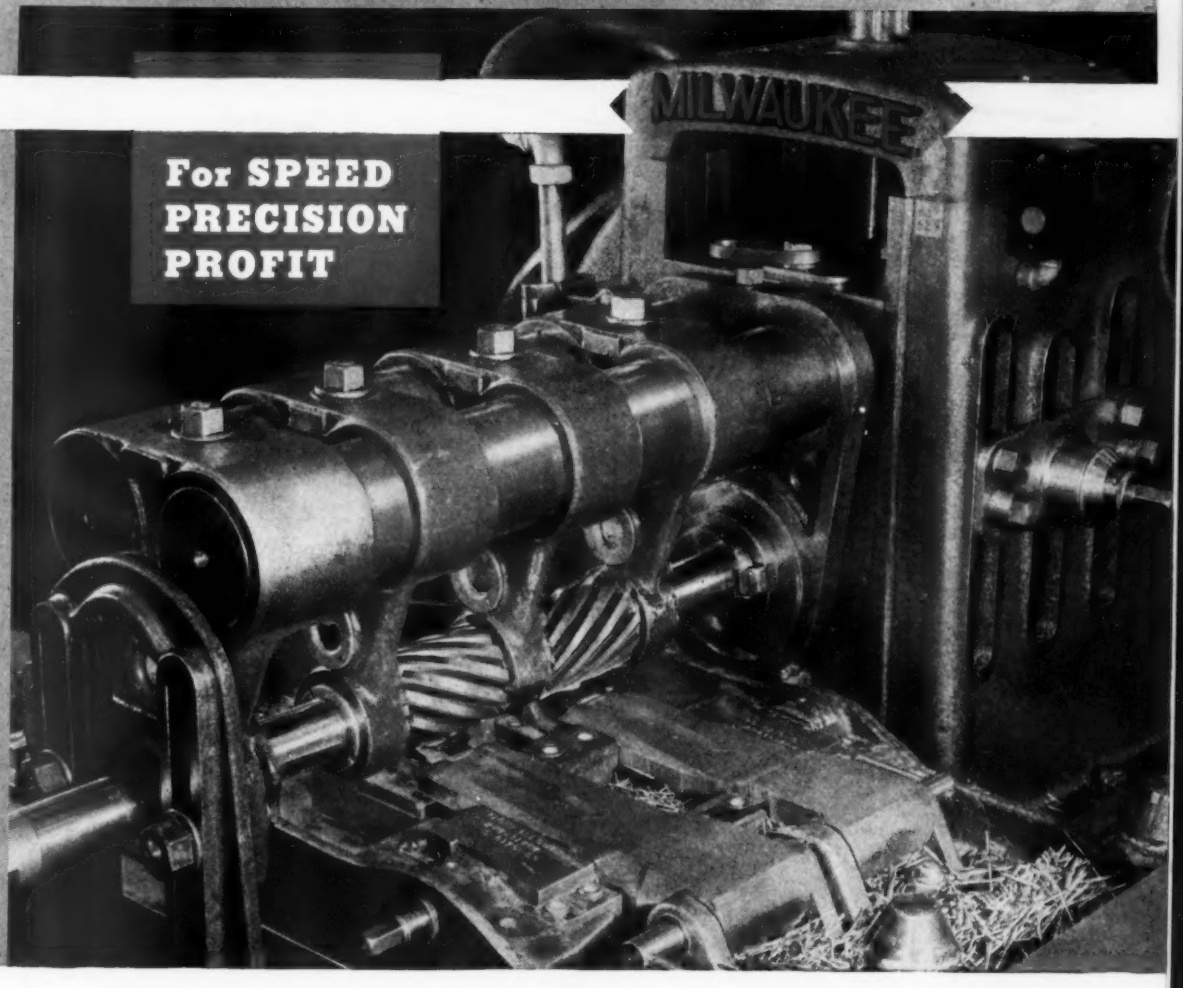


Write today for your descriptive bulletin on the JIGMIL.

The JIGMIL does most production boring and milling work faster and more accurately with rugged tools working in the open than is possible with the part trapped inside the walls of a boring fixture.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

YOU CAN SAY THAT AGAIN –
"PUT IT ON A *Milwaukee*"



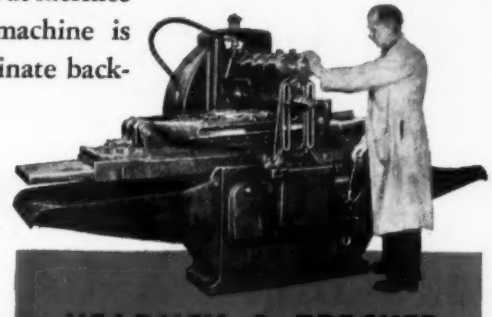
This heavy contour milling operation on a 1248 Milwaukee Simplex Milling Machine illustrates the rigidity of the machine itself. Using a rise and fall fixture the helical plain milling cutters removed ⅛ inch to 3/16 inches of stock from a steel forging. Ample cutter support is provided by the outer arm brace and the four arbor supports.

Often called "production type milling machines", the Milwaukee Simplex Series machines are designed for strength, compactness, and rigidity to withstand the strain of continuous quantity production.

Spindle construction is such as to provide greater range without sacrifice of rigidity. Basically designed for climb milling, this machine is equipped with an adjustable nut and ground screw to eliminate backlash in both directions of the table. Workpieces, ordinarily difficult to hold, are milled at faster feeds, with smoother finish and increased cutter life.

Write for new descriptive Bulletin B20 giving complete details on the Milwaukee Simplex and Duplex Series of Milling Machines.

Over-all view of the Milwaukee Simplex machine used on the above milling operations.



KEARNEY & TRECKER
CORPORATION
MILWAUKEE 14, WISCONSIN

Milwaukee Machine Tools

RECOIL CYLINDERS • GUNS • CANNONS • BEARINGS • GEAR ASSEMBLIES • INTERIOR OF FUEL
TANKS • FITTINGS • CONTROL CABLES • MACHINE GUN MOUNTS • STRUTS • HOLLOW TUBING

Pre-tested for each use . . .

MARATHON *specialized* RUST PREVENTIVES

To protect operating equipment, surplus equipment, parts of assemblies in work or storage, and overseas shipments, you need more than just a rust preventive . . . you need *the specialized rust preventive you know will do the job.*

Long before Marathon Specialized Rust Preventives were released, tests were completed on a wide variety of applications. The results of these tests assure the greatest margin of anti-corrosion safety when you use the recommended Marathon Rust Preventive on a specific job.

COMBINED USES

Research has revealed broader uses for many Marathon Rust Preventives. This helps you to hold down inventories by using one preventive for more varied applications. And, at the same time, you can be sure of "specialized" protection.

Always a good investment in terms of thousands of dollars saved by preventing damage to metal parts and products, Marathon Rust Preventives extend economies even farther. They are moderate in price and extremely economical to use—a little goes a long way. All Marathon Rust Preventives are compounded to government specifications with the exception of one all-purpose compound.

Write, wire or phone for an Ohio Oil rust prevention specialist to call. He will be glad to show you reports of tests and recommend the essential Marathon Rust Preventives needed for application to your machinery and products.

THE OHIO OIL COMPANY

Producers of Petroleum since 1887

GENERAL OFFICES: FINDLAY, OHIO

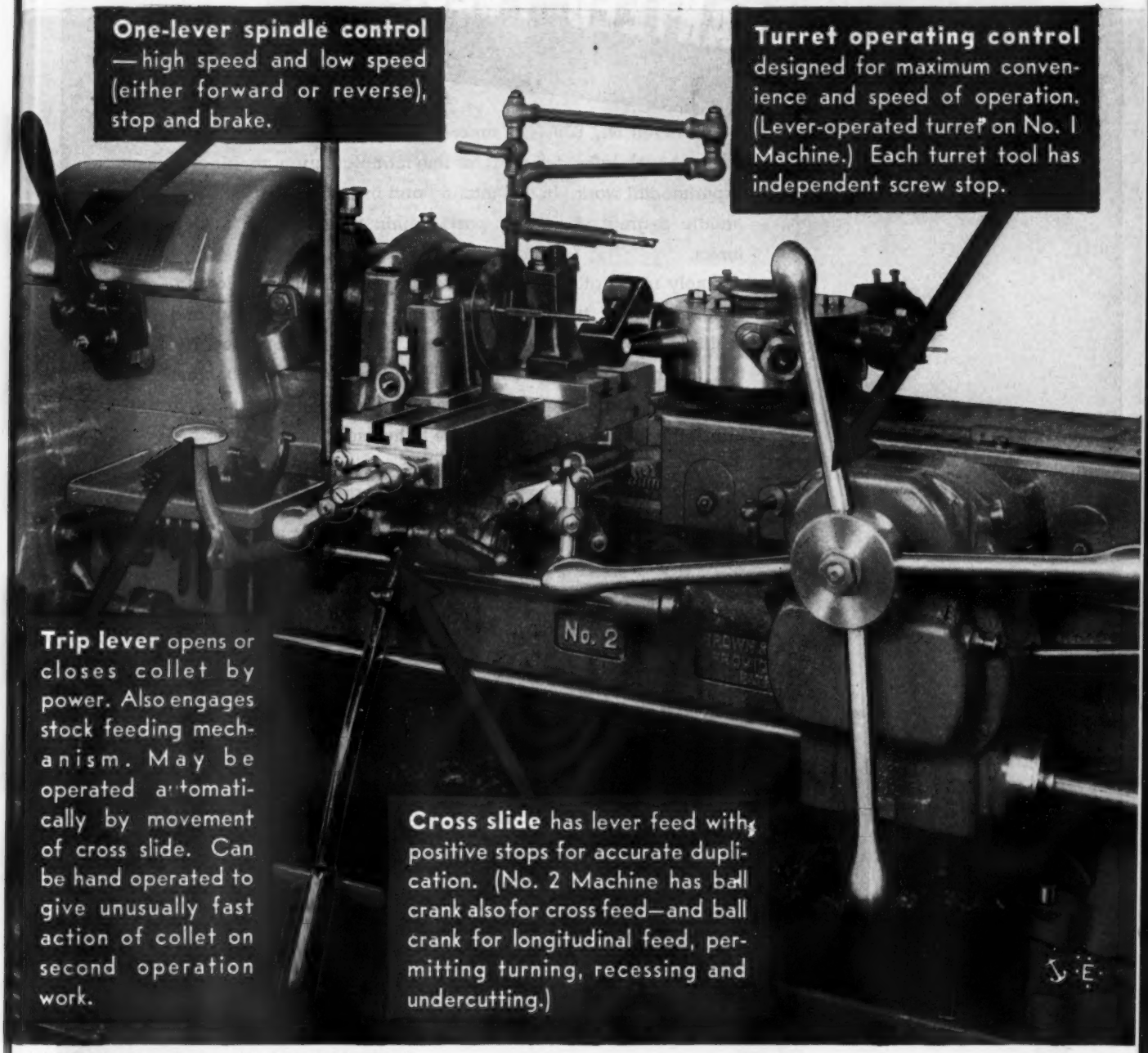
District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

GEAR ASSEMBLIES • INTERIOR OF FUEL TANKS • FITTINGS • MACHINE GUN MOUNTS • STRUTS • HOLLOW TUBING

SIMPLE CONTROLS — FAST OPERATION

Give Maximum Production

on Bar Work and Second Operations



One-lever spindle control — high speed and low speed (either forward or reverse), stop and brake.

Turret operating control designed for maximum convenience and speed of operation. (Lever-operated turret on No. 1 Machine.) Each turret tool has independent screw stop.

Trip lever opens or closes collet by power. Also engages stock feeding mechanism. May be operated automatically by movement of cross slide. Can be hand operated to give unusually fast action of collet on second operation work.

Cross slide has lever feed with positive stops for accurate duplication. (No. 2 Machine has ball crank also for cross feed—and ball crank for longitudinal feed, permitting turning, recessing and undercutting.)

No. 2 Machine shown with Automatic Feed for Turret Slide — an extra which further speeds production on turning long lengths.

Write for booklet completely describing these modern versatile screw machines.

B·S BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.

Accurate-Efficient-Profitable

Nos 1 and 2 Wire Feed Screw Machines

BROWN & SHARPE

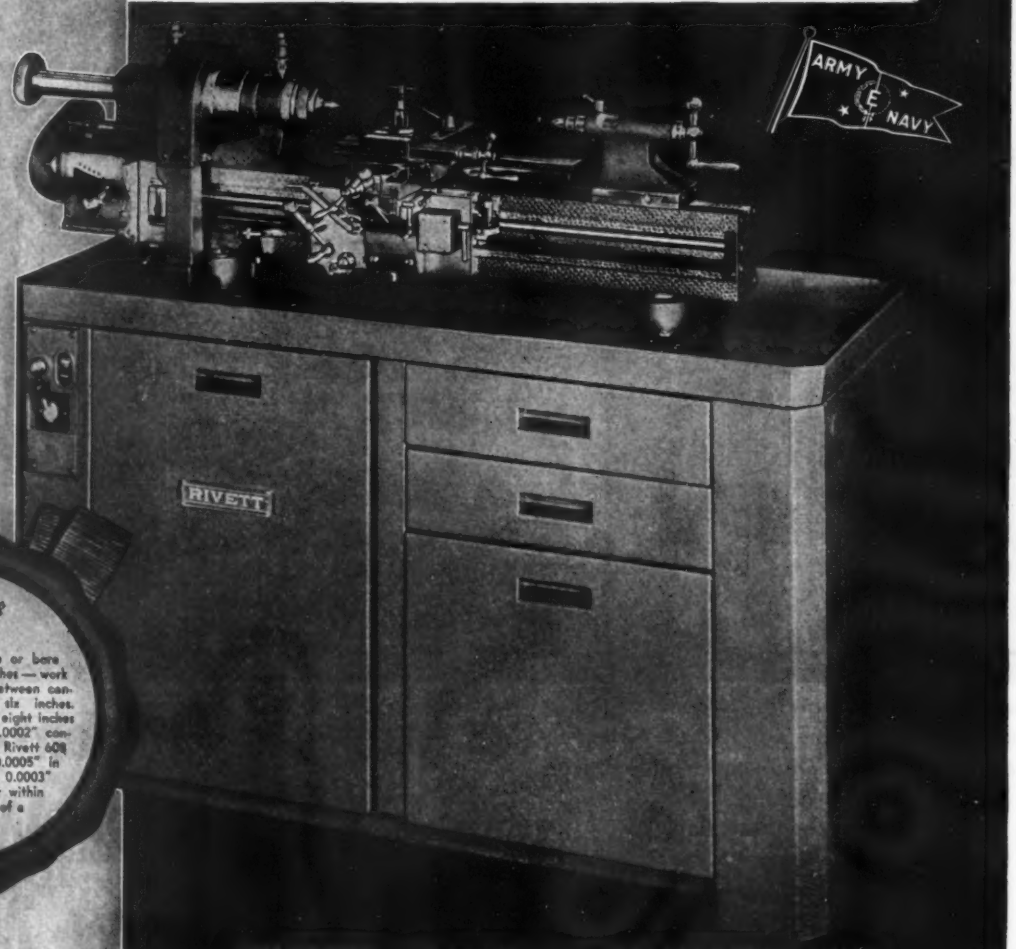
A ONE MACHINE TOOLROOM WITH GUARANTEED PRECISION

RIVETT

The Rivett No. 608 is a super-precision, back-geared screw-cutting bench lathe designed for fine manufacturing, repair and experimental work. In tool-making and instrument shops it will handle a great variety of parts within the closest precision limits.

Finely made attachments for milling, spiral cutting, slotting, relieving, taper turning, ball turning, grinding, forming and multiple operations enable the user of a fully equipped No. 608 to finish his work completely without recourse to other machines, and throughout his entire series of operations to utilize the inherent precision of the lathe itself.

Write for Bulletin 608

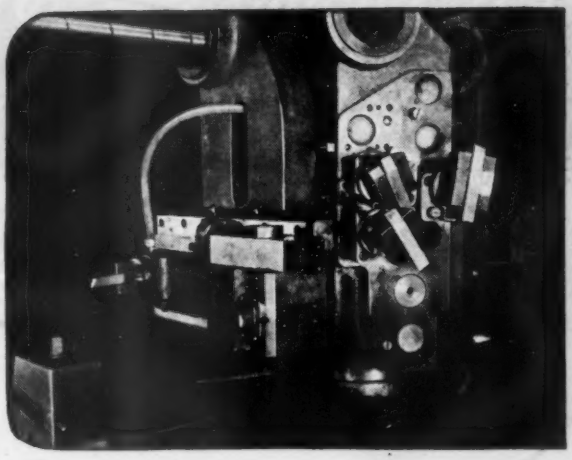


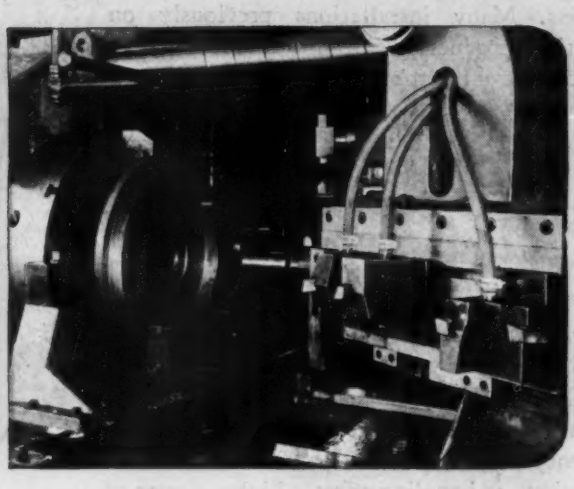
Guarantee

The Rivett 608 will turn or bore within 0.0001" in six inches — work held in collet, and turn between centers within 0.0001" in six inches. The Rivett 608 will face to eight inches diameter within limit of 0.0002" concave, 0.0000" convex. The Rivett 608 will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.





Your ORIGINAL INVESTMENT IN P & J EQUIPMENT INCLUDED RE-TOOLING POSSIBILITIES...

Take advantage of them—NOW!

Aside from the capacity of the machine, there are no practical limits to the variety of work that can be handled on P & J Chucking Equipment. Flexibility in tooling, with ample power to back up heavy cuts, is an advantage inherent in P & J equipment, which can readily be taken advantage of at any time.

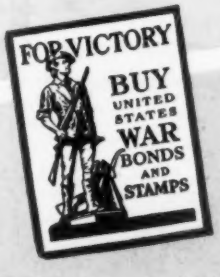
When the 8 DXT P & J Automatic Chucking Machine illustrated here was purchased, a special tooling set-up was designed and furnished for machining flywheels. However, without changing basic outstanding features and performance, this machine can be re-tooled to handle other work.

P & J owners purchased re-tooling possibilities when they invested in P & J Equipment. Now, with re-conversion in the offing, is an opportune time to re-tool and obtain extra dividends on the original investment. Ask P & J engineers for assistance.

POTTER & JOHNSTON MACHINE COMPANY

Pawtucket, R. I.

EVERY BOND YOU BUY IS AN INVESTMENT IN FREEDOM

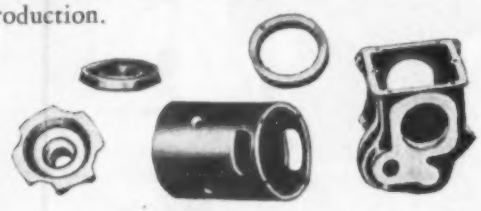


P & J REBUILDING SERVICE . . .

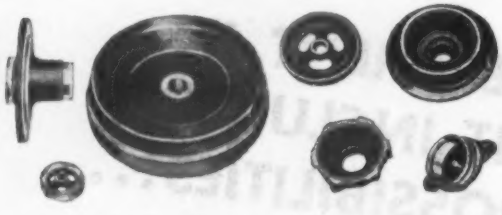
Your present P & J equipment can probably be restored to its original accuracy and productivity by rebuilding in our shop. It will pay you to investigate. Re-tooling can be handled conveniently at the same time.

HOW A BULLARD MULT-AU-MATIC FITS POSTWAR PLANNING

Bullard Mult-Au-Matics over a period of years have been tooled for thousands of different types of work, some of which are shown in the illustrations. Many installations previously on peacetime products were quickly converted at low cost to meet the requirements of wartime production.

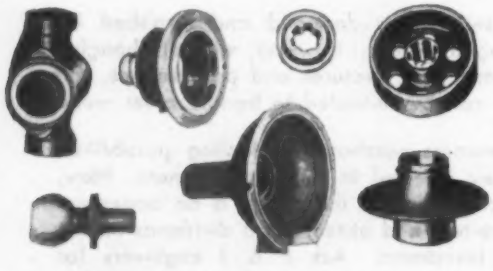


Looking now towards reconversion to peacetime needs, prewar or wartime machines will require retooling, and Bullard engineers stand ready to figure your costs for maximum production and efficiency on your postwar jobs. Well-balanced operations and tooling effect a higher degree of



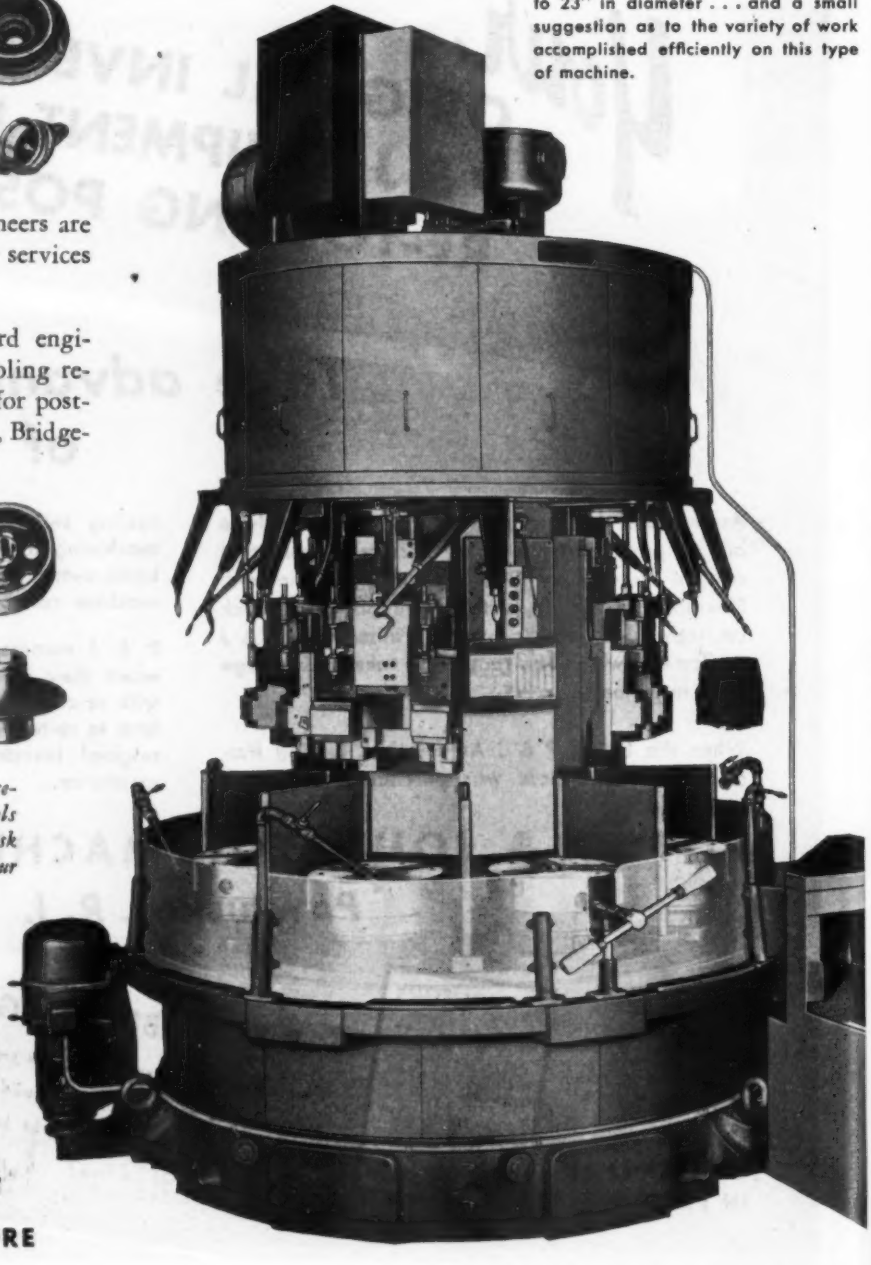
Mult-Au-Matic efficiency. Bullard engineers are well versed in this technique and their services are your logical choice.

Send blueprints or samples for Bullard engineering time and cost estimates on tooling reconversion. Prepare now and be ready for postwar competition. The Bullard Company, Bridgeport 2, Connecticut.



From Government Machine Tool Surplus Lists select the better machines to replace obsolete models you've been using on non-critical operations. Ask Bullard by serial number for information on your selections.

Bullard Type "D" Mult-Au-Matics with 6 or 8 spindles in 4 sizes for work up to 23" in diameter . . . and a small suggestion as to the variety of work accomplished efficiently on this type of machine.

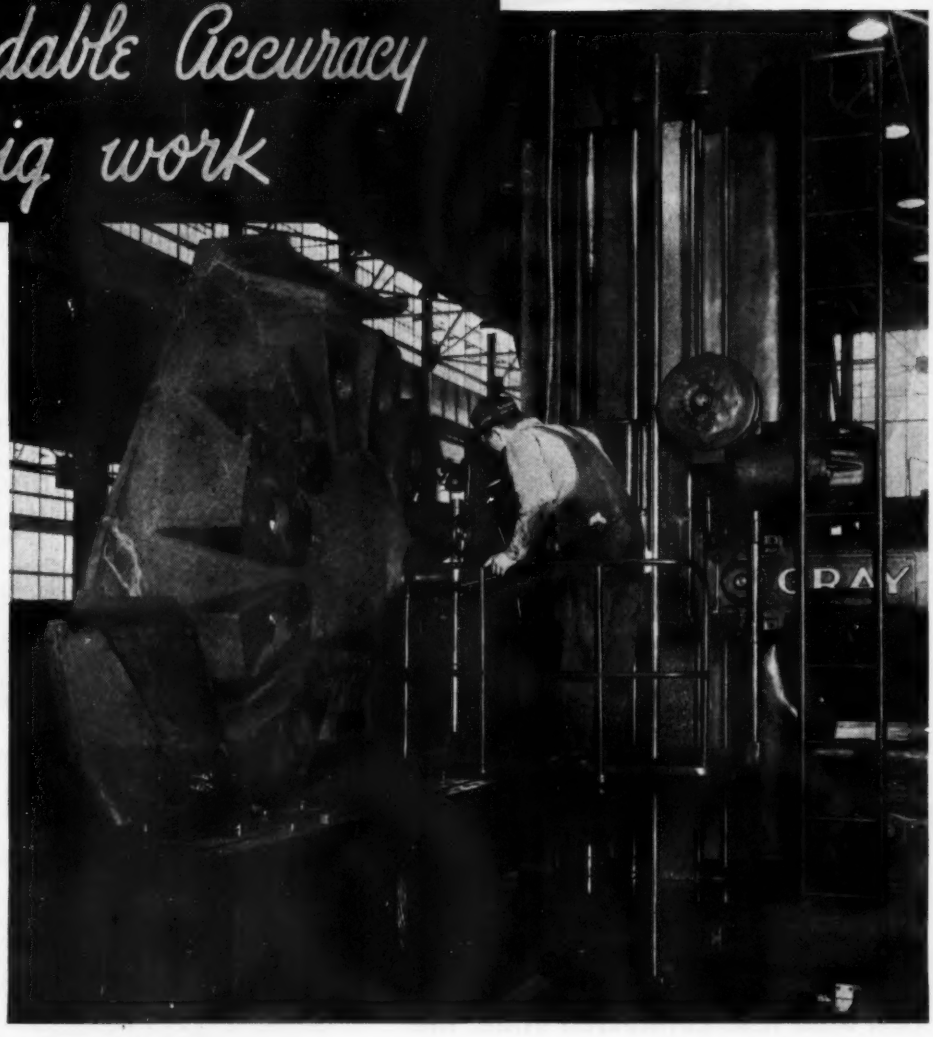


BULLARD

CREATES *NEW METHODS*

TO MAKE MACHINES DO MORE

For Dependable Accuracy on big work



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GRAY HORIZONTAL BORING, DRILLING *and* MILLING MACHINE

● The huge iron casting shown is the tool table for a six station indexing machine twelve feet in diameter and fourteen feet high. The completed machine is now being used in the production of 155 M/M shells.

The casting has a center hole 12" in diameter. The ten indexing holes are 8" in diameter. The chord distance between indexing holes is 18.635" and radial distance from center hole is 72.000". In spite of the unusual size of the table it was machined well within the exacting limits of accuracy required by precision station indexing machines.

For your precision boring, drilling and milling operations on large work you can depend on the Gray Floor Type Boring Mill.

THE G. A. GRAY COMPANY

3610 WOODBURN AVENUE • • • CINCINNATI 7, OHIO, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

"Tops" for the Tool Room

The new tool room grinding wheel of the Mid-West Abrasive Company clearly shows its superiority in high speed tool steel operations.

Test after test, conducted under the most rigorous conditions, together with many months of actual operation in high production plants throughout the United States, demonstrate that the Mid-West wheel is "tops for the tool room."

You'll find this exemplified also in Mid-West honing stones, sharpening stones, sandpapers, or any of Mid-West's broad range of abrasive products.

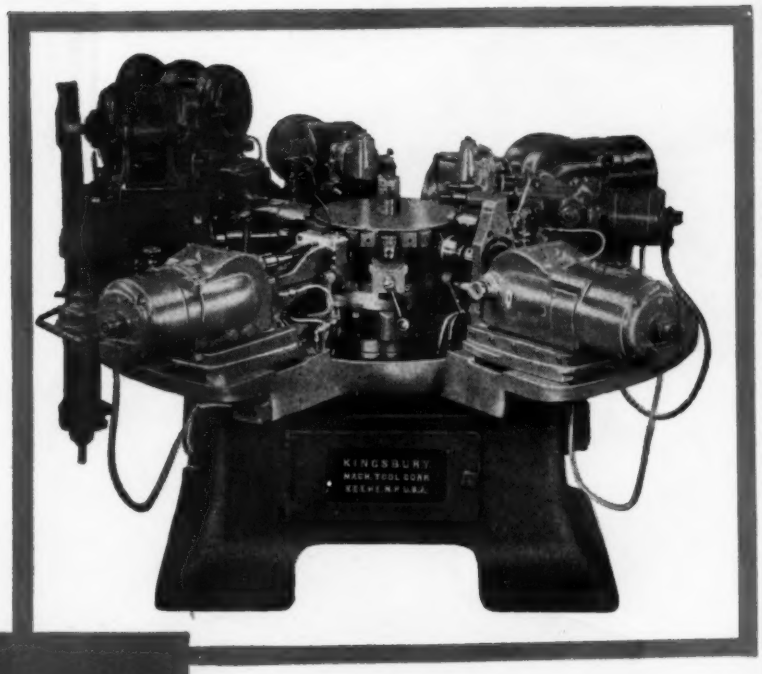
Let a Mid-West field engineer show you how to solve your abrasive problem.

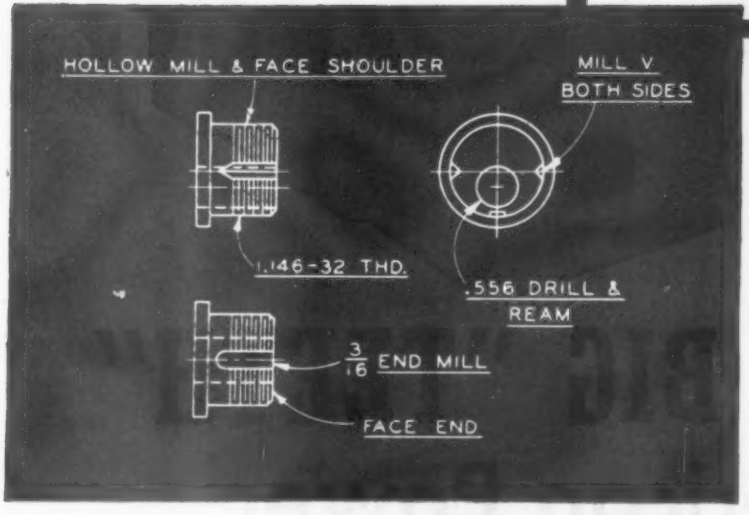
MID-WEST ABRASIVE CO.

Manufactures of DEPENDABLE Abrasives

Owosso, Mich. • Detroit • Rochester, Pa.

Ability to handle widely different operations at top speed proves the value of versatility





THIS IS A FLEXIMATIC SPEED UP JOB

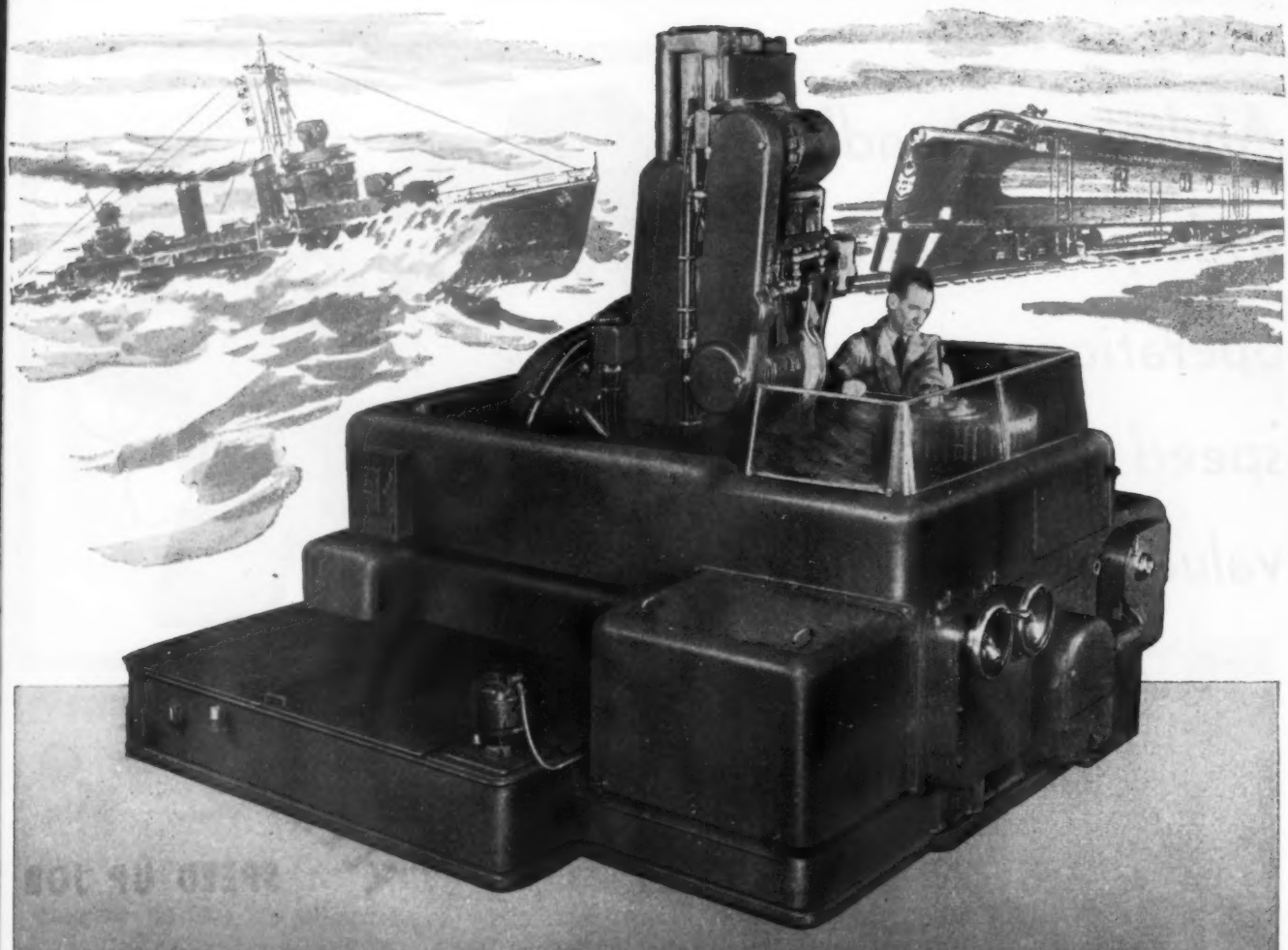
FLEXIMATIC
by KINGSBURY

KINGSBURY versatility is well exemplified in the widely different machining operations performed on bronze lock cylinders. For example, note that hollow milling, facing, V-milling, drilling, reaming, end milling and end facing are included in this set-up on a Model GD FLEXIMATIC. By being able to handle all these operations with a *single chucking of the work*, production is stepped up tremendously.

Whether it's a lock part or a complicated piece involved in ordnance production, the FLEXIMATIC can be depended on to meet exacting requirements. Its versatility is practically unlimited because of the basic nature of the method utilized in building up standard units around an indexing turret, each unit designed for handling a specific operation. Not only does this method provide for a wide variety of operations simultaneously but also makes change-over readily possible to meet the requirements of other jobs which call for still different machining combinations.

Whatever the set-up, high production and utmost precision are assured by FLEXIMATICS.

KINGSBURY MACHINE TOOL CORPORATION
KEENE NEW HAMPSHIRE U S A



GRINDING BIG "TEETH" for American Power

P&W 26" Universal Hydraulic Vertical Gear Grinder . . .

The precision gears that swing a battlewagon's big guns into position — or transmit smooth-flowing power to the driving wheels of diesel-electric locomotives . . . these are the kind of jobs where this newest Pratt & Whitney gear grinder shines.

It works quickly and accurately, holding fine tolerances which are so necessary for smooth, efficient operation on power drives. Vital war production on Navy gun mounts has already put this huge machine to the test — has shown that precision grinding of these big gears pays dividends in quieter, trouble-free operation, and longer gear life.

Information on the P&W 26" Universal Hydraulic Vertical Gear Grinder is now available and will be supplied upon request. This same machine, without conversion, will grind the big precision gears for peacetime power drives. Find out the details now.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

*Suggestion Number Two**

FOR REDUCING CONSUMPTION OF STEEL CUTTING CARBIDE

* *Suggestion Number One was Kennametal "Universal" Blanks*

USE A LIGHTER KENNAMETAL TOOL, IN A "HOME-MADE" ADAPTOR, ON FINISH-TURN OPERATIONS

Efficient use of carbide tools—always important—is imperative today, because of the demands of a large shell-making program. Every possible means for promoting economy should be utilized to avoid tool shortages, and consequently delayed production.

On most finish-turn operations carbide can be conserved, and tooling costs can be reduced, by using tools 1" square or smaller, mounted in the tool block by means of a simple adaptor which can readily be made in any shop. For example, in a major shell-plant, the finish-turn operation on a 155mm shell, using a 1½" square-shank Kennametal-tipped tool, required .72 calculated grams of Kennametal, at a tool cost of 8¢ per shell—very economical production. Yet, by using a ¾" square-shank Kennametal-tipped tool in an adaptor, carbide consumption was cut in half (.36 calculated grams), and tool cost was reduced to 3.3¢, per shell finish-turned.

The diagrams at the left show how ¾" square-shank tools can be mounted in adaptors that fit tool holders built to take shanks 1¼" or 1½" wide. Similar adaptors can be devised and made by you for other conditions. On lathes built to take tool shanks 1" x 1½", or 1" x 1¾", it is economical to use a ½" or ¾" shim under a 1" square-shank Kennametal-tipped tool.

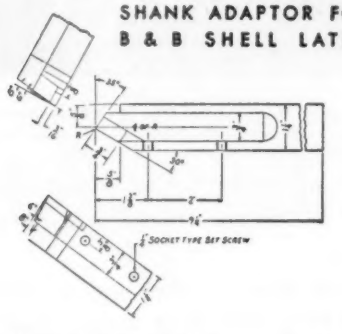
By using inherently efficient Kennametal, in conservative size blanks, as suggested above, a two-way saving in carbide consumption can be effected.

Kennametal engineers, fully experienced in the application of cemented carbides, will be glad to help manufacturers get the best and longest tool service in shell production.

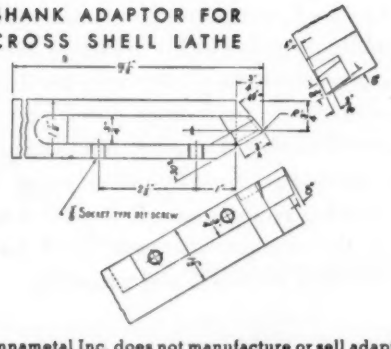
KENNAMETAL
SUPERIOR CEMENTED CARBIDES
KENNAMETAL Inc., LATROBE, PA.

TWO TYPES OF ADAPTORS THAT YOU CAN EASILY MAKE*

SHANK ADAPTOR FOR B & B SHELL LATHE



SHANK ADAPTOR FOR CROSS SHELL LATHE



* Kennametal Inc. does not manufacture or sell adaptors. The sketches above are typical suggestions for making your own adaptors. Blue prints from working drawings will be furnished on request.

FLYING MACHINE SHOPS BACK UP THE B-29'S

Interior views of a Commando Flying Machine Shop of the XX Bomber Command equipped with a South Bend Lathe. Official U. S. Army Photos.

Flying machine shops are playing a vital behind-the-scenes role in the operation of the B-29 "Superfortresses" now carrying on the air offensive against Japan.

With ordinary repair facilities, it takes days or even weeks to repair bombers grounded away from their bases—often they have to be abandoned. Now Curtiss Commandos fly machine shop facilities to these planes, enabling them to quickly return to their bombing missions. These flying machine shops, through the diversity of their metal working equipment, are performing every type of repair work except the complete rebuilding of engines and planes.

The unprecedented job being done by these flying machine shops is bolstering our striking power where it is needed the most. As an important part of this equipment, South Bend Lathes are contributing their dependability, accuracy, and versatility.

Write For
NEW LATHE CATALOG
Shows all South Bend Engine Lathes, Toolroom Lathes, and Precision Turret Lathes in full color. Ask for Catalog 100-D.

SOUTH BEND LATHE WORKS
Lathe Builders for 38 Years
419 EAST MADISON STREET SOUTH BEND 22, INDIANA

ENERGY... TIME...Saved Here

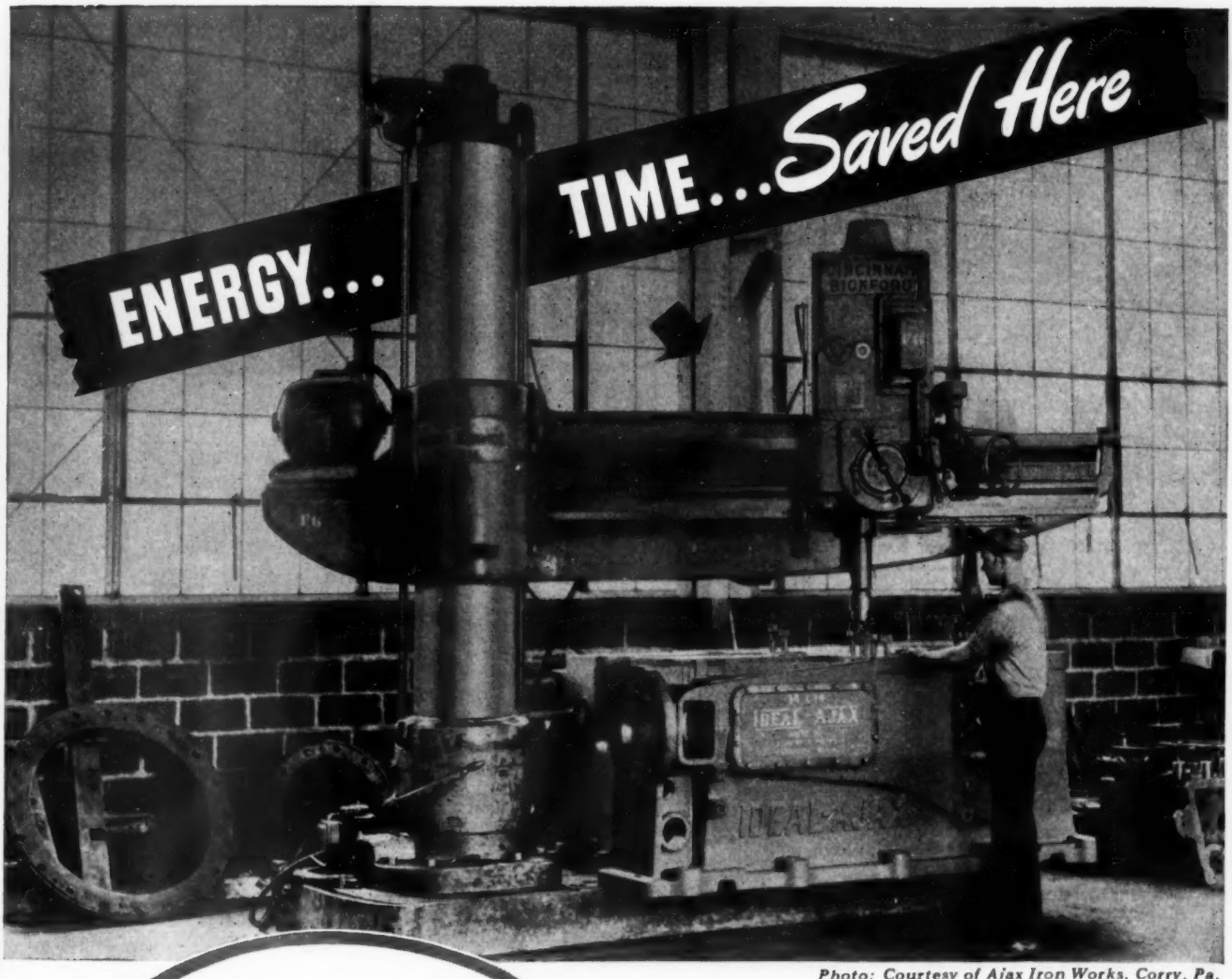
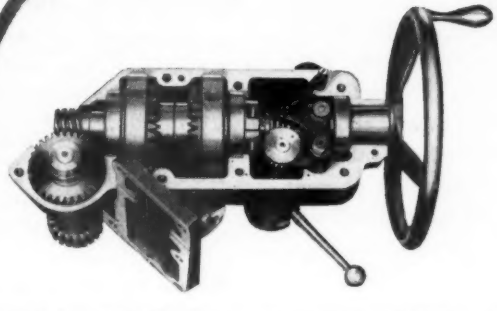


Photo: Courtesy of Ajax Iron Works, Corry, Pa.



The Rapid Power Traverse rapidly and surely spots the tool and automatically stops on meeting any obstruction. It is safe in operation (the hand wheel does not spin)—a smooth functioning, time saving mechanism.

Equal Efficiency of Every Unit Makes the Balanced Machine

100% concentrated on the head, all control levers are always close to the work and the operator's hand. No wasted effort walking to controls—and the light pressure to operate the levers saves the operator from fatigue. On this job at the Ajax Iron Works, Corry, Pa., the holes are wide spread and Cincinnati Bickford centralized controls save much time and energy.

Write for detailed Bulletin R-24 A.

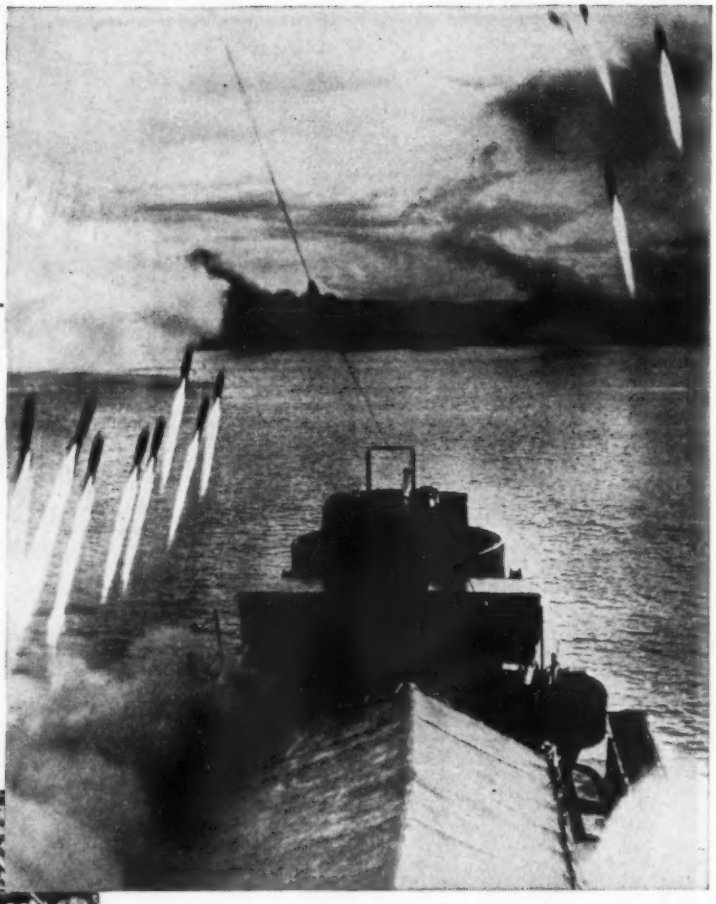
See our condensed catalog in Sweet's File.

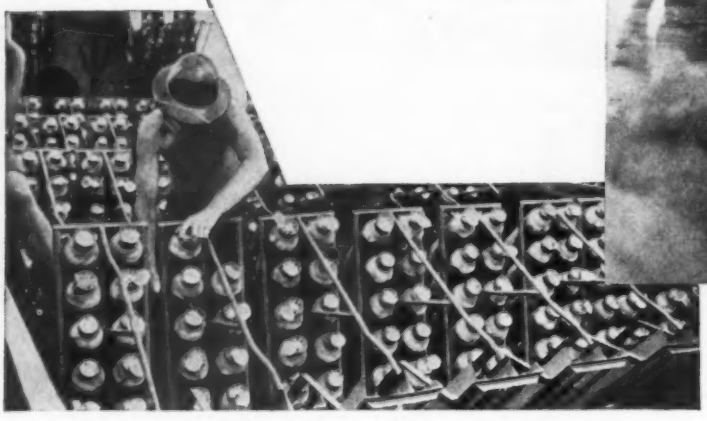
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

METAL . . .

WORKING!





Rocket bombardment of Pacific island. Photo at left shows one of the rocket firing racks being loaded on the deck of an LCI.

"BAZOOKA BOATS" is the Navy's nickname for these rocket-firing landing craft. Here indeed is "hot" metal — working to knock out enemy defenses just before our invasion troops swarm ashore. Rocket projectiles are so effective for many jobs that the navy has budgeted nearly $100,000,000 a month for them — as much as previously spent for all other types of naval ammunition combined.

In stepping up production to meet this tremendously increased demand, the metal working industry knows that faster machining must still go hand-in-hand with accuracy — and this can be done only through the use of highly efficient cutting fluids.

Texaco Cutting and Soluble Oils not only assure faster machining, but better finish and longer tool life as well. That is why they are the choice of experienced machine tool operators everywhere.

Texaco cutting fluids cool and lubricate the tools, carry away heat and prevent chip welding — thus prolonging tool life, reducing down-time for tool changes, assuring greater output.

The services of a Texaco Engineer specializing in cutting coolants are available through more than 2300 Texaco distributing plants in the 48 States. Get in touch with the nearest one, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

RECONVERSION RUSTPROOFING

5 Points to Remember

1. Upon termination of war contracts, Government-owned production equipment must be rustproofed promptly, in accordance with *official instructions.*
2. Ordnance Specification P.S. 300-4 contains *official instructions* for the complete processing of such equipment.
3. These instructions require that only rustproofing materials meeting Government specifications be used.
4. *Texaco rustproofing products meet Ordnance specifications for application on Government-owned equipment.*
5. For full information, see your Texaco representative or write to us.

TEXACO

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT—CBS

What AMERICAN MACHINIST'S Inventory Reveals

ONE EXAMINES with mixed feelings the 1945 inventory of metal-working equipment taken by AMERICAN MACHINIST and published in the following pages.

Many conclusions that one may have arrived at for himself, in thinking about the developments during the last five war years, are confirmed by the inventory's facts and figures.

The proportion of machine tools over ten years old has dropped sharply. That was to be expected with machine tool building at unprecedented heights.

The tremendous industrial potentialities of the United States are indicated by the installation in metal-working shops today of an estimated 1,711,137 machine tools, over half a million more than existed in 1940. Never before has any nation had so many production tools.

But the analysis is not as simple and as cheering as it may seem at first glance. About 600,000 of the country's machine tools belong to the federal government. It is anyone's guess where they eventually will wind up and to what use they will be put.

American industry, based on its ownership of equipment, cannot point with pride to its own record. Some 54 percent of its tools are over ten years of age. Moreover, its equipment now is proportionately older than it was in 1930, fifteen years ago.

To be specific, one of the country's largest corporations, distinguished for its alert and progressive management, has discovered by actual count that its tools average fifteen years in age. In this situation it has plenty of good company.

The conditions bared by the inventory represent a challenge and an opportunity. The challenge is for American industry, faced by high labor costs and by the most severe competition at home and abroad, to bring down substantially the age of its equipment and hence to lower its production costs.

The average age as tabulated in the inventory is such that thousands of plants are attempting to operate with machines of obsolete design, units that long ago ceased to be an asset if low costs and quality of product mean anything.

Facing these plants is the opportunity to modernize their equipment and thereby tone up their efficiency and strengthen their competitive position. They should avail themselves of the chance to buy whatever government surplus machines will fit their needs, at the same time discarding the old tools of fifteen and twenty years vintage that will be a distinct liability in the postwar period.

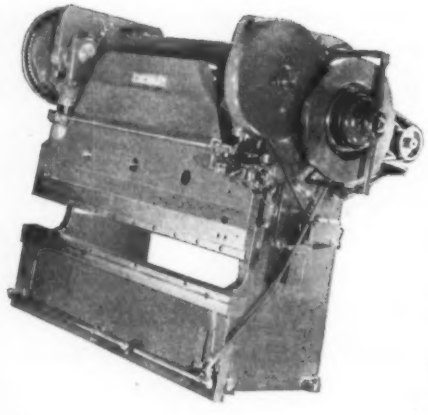
More than that, if they intend to keep in the front rank, they must invest in the new tools that represent the newest practices developed by the ingenious engineers and designers of the machine tool industry.

More than ever, machine tool builders from now on will cater to specialized requirements of the country's metal-working shops.

Only a foolish person would wager that the shop in which 54 percent of the tools are over ten years old will have the same measure of success as the one with tools only half that age.

Burnham Finney

MORE JOBS THAN YOU CAN THINK OF



It is a long list of jobs that a Cincinnati Press Brake will do . . . forming, progressive forming, corrugating, notching, punching, and others. The majority of jobbing work can be handled with simple dies. The "goose-neck" die illustrated is a relatively simple die for making channels and other special shapes which cannot be made with a straight male die. Special dies further increase the wide utility of Cincinnati Press Brakes.

Write for Catalog B-2 or consult our Engineering Department on your special problem.

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

AMERICAN MACHINIST 1945 INVENTORY SHOWS 38% OF ALL METAL-WORKING EQUIPMENT OVER 10 YEARS OLD

If government-owned tools are excluded, machines more than ten years of age rise to 54 percent, 1945 inventory reveals

THIRTY-EIGHT PERCENT of all metal-working equipment installed in American industry, is over ten years old. Conversely, sixty-two percent of the production machines in metal-working plants today is less than ten years of age and is of relatively modern design.

That is not the whole story, however. If one should exclude from consideration the machine tools and other production equipment owned by the United States government and count only the machines owned by private manufacturers, the ratio of machines over ten years of age amounts to fifty-four percent.

These figures represent the final results of the 1945 American Machinist Inventory of Metal-Working Equipment. American Machinist has taken such an inventory every five years since 1925. The work of compiling this inventory has been under

way for five months and has been the most gigantic task ever undertaken by this magazine. Returns have been greater than ever before.

The final figure of thirty-eight percent (fifty-four percent if government-owned machines are excluded) compares with seventy-two percent in 1940, sixty-six percent in 1935, and forty-nine percent in 1930.

CERTAIN IMPORTANT BASIC FACTS WERE UNCOVERED BY THE NEW INVENTORY

1

The country's metal-working shops today possess 1,711,137 machine tools. All of these machines fall within the definition of a "power-driven machine, not portable, that removes metal in the form of chips."

2

About 652,185 machine tools now in place are over ten years old.

3

The total number of machine tools installed is some 710,000 units more than in 1940, a natural outgrowth of war requirements.

4

The government owns roughly over 600,000 machine tools, though exact information about its holdings has not yet been gathered.

5

The largest increase in machine tools and in other metal-working equipment has been in the aircraft industry, which now has 276,466 units as against 9,000 in 1940.

6

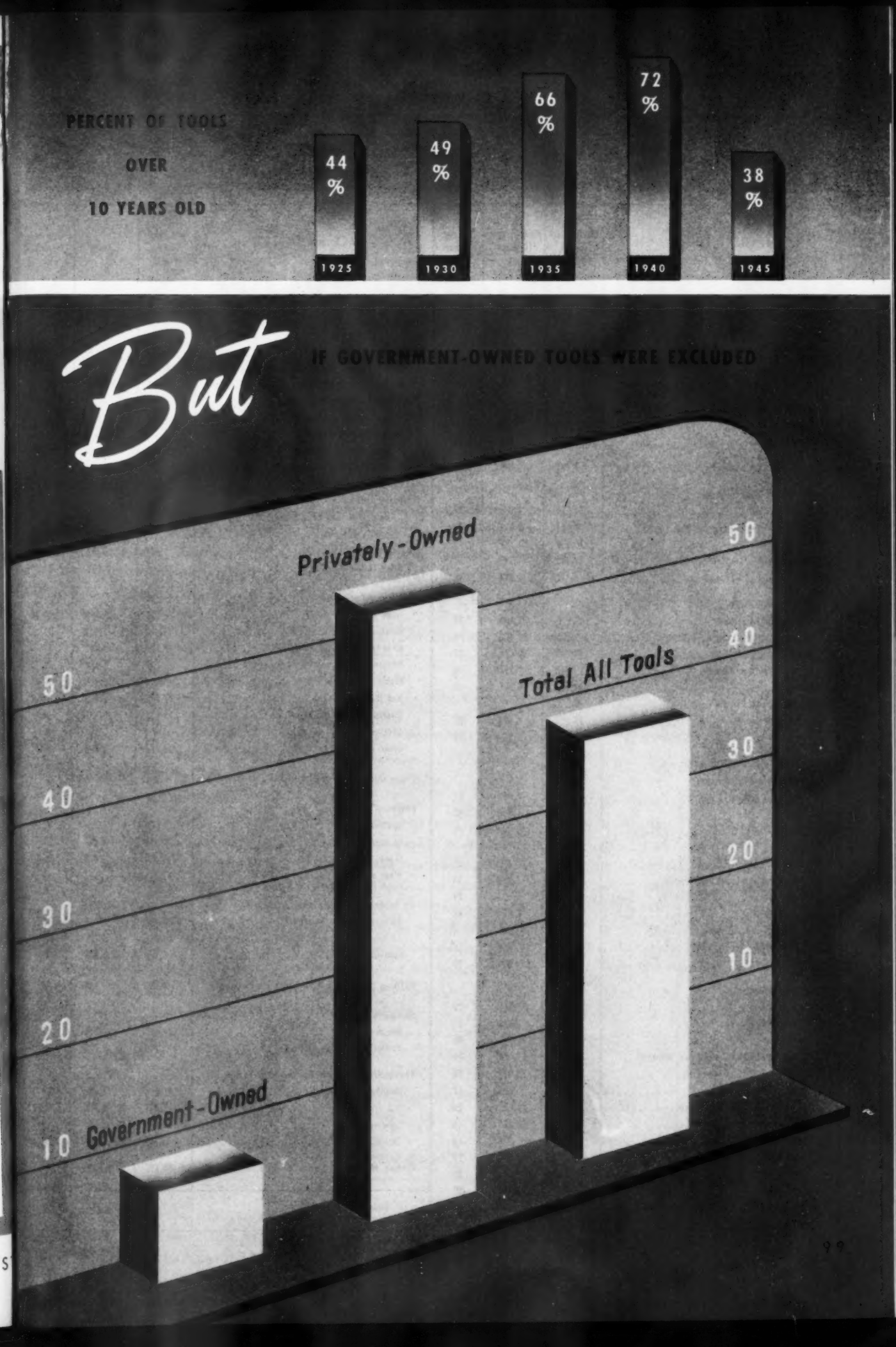
The West Coast, thanks to aircraft and shipbuilding, shows by far the sharpest gain of all regions in the percentage of machines installed over the past five-year period.

7

The proportion of equipment over ten years of age varies widely by individual industries, ranging from only two percent in the aircraft field to sixty-two percent in the business machines field.

8

One inescapable conclusion is that the metal-working plants of the United States are not as well off today from the standpoint of modernization as they were at the start of the depression in 1930, based on their ownership of machine tools.


PERCENT OF TOOLS
OVER
10 YEARS OLD
44 %
1925
49 %
1930
66 %
1935
72 %
1940
38 %
1945
But
IF GOVERNMENT-OWNED TOOLS WERE EXCLUDED
Privately-Owned
Total All Tools
Government-Owned
50
40
30
20
10

AMERICAN MACHINIST'S 1945 INVENTORY OF MACHINE TOOLS OPERATED BY METAL-WORKING INDUSTRIES

MACHINE TOOLS	A Total Units Now in Place	B Number over 10 years old	C % over 10 Years old
Boring Machines			
Horizontal Boring, Drilling and Milling	13,758	6,334	46
Vertical Boring Mills	12,115	7,737	64
Precision, Horizontal and Vertical	15,637	895	57
Jig Boring	3,813	713	19
Other	5,014	1,501	30
Broaching Machines.			
Horizontal	5,256	2,616	50
Vertical	4,445	800	18
Centering Machines	3,458	1,894	55
Cutting-off Machines			
Bandsaw	24,350	5,340	22
Rotary hot or cold saw	7,661	3,836	50
Hacksaw	30,058	13,161	44
Abrasive disk	7,812	1,299	17
Other	5,875	2,286	39
Drilling Machines			
Upright: Single-Spindle	163,592	62,366	38
Multiple-Spindle	49,110	22,580	46
Sensitive: Single-Spindle	40,982	10,728	26
Multiple-Spindle	19,416	9,798	50
Radial	34,564	14,517	42
Special Purpose, Single and Multiple Spindle	17,294	4,698	27
Other	12,864	2,561	20
Gear-Cutting Machines			
Formed Rotary-cutter type:			
Spur and helical	3,912	2,997	77
Bevel	791	656	83
Rack	360	284	79
Generators:			
Shaper type	12,367	2,627	21
Bevel, spiral bevel and hypoid	7,193	1,718	24
Herringbone	432	124	29
Hobbing	16,100	6,454	40
Shaving and finishing	9,600	748	8
Burnishing and lapping	3,266	514	16
Other	1,013	306	30
Grinding Machines			
Cutter and tool	79,215	21,691	27
Drill and tap	11,516	2,886	25
Floor Stand	61,110	26,505	43
External cylindrical, plain and universal	55,277	15,026	27
Centerless	14,769	3,814	26
Internal cylindrical	27,077	4,696	17
Surface, horizontal and vertical	49,931	11,925	24
Disk, horizontal and vertical	11,652	5,220	45
Thread	5,941	214	4
Abrasive belt	9,070	1,352	15
Cam and contour	2,249	516	23
Swing frame	4,273	2,222	52
Other	34,384	13,080	38
Honing and Lapping Machines	16,134	2,119	13
Keyseaters	4,466	3,202	72
Lathes			
Bench	48,926	15,833	32
Engine (incl. toolroom)	140,214	74,157	53
Automatic multiple-spindle (incl. screw machines)	45,098	13,592	30
Automatic single-spindle (incl. screw machines)	30,991	13,947	45
Semi-automatic	16,605	4,702	28
Wheel and axle (railroad)	630	589	93
Turret Lathes			
Ram type and hand screw	71,825	21,955	31
Saddle type	30,087	12,223	41
Gun boring	1,162	353	30
Other lathes	32,963	12,230	37
Milling Machines			
Hand (no power feed)	22,065	10,992	50
Bench	4,400	1,373	31
Knee-type, plain and universal	67,196	30,072	45
Vertical	27,205	7,094	26
Planer type	5,000	2,501	50
Bed (Lincoln) type	17,962	4,390	24
Duplicators and Profilers	13,562	2,385	18
Continuous (incl. rotary)	3,508	1,387	40
Other	10,865	3,792	35
Pipe Cutting and Threading Machines	10,241	5,014	49
Planers			
Standard	13,176	10,998	83
Open-side	2,497	1,290	52
Crank	481	408	85
Plate and angle	273	117	43
Polishing and Buffing Machines			
Abrasive wheel, floorstand	38,892	17,333	45
Abrasive belt or disk	10,214	2,294	22
Automatic	8,278	3,947	48
Rifling and Rifle Reaming Machines	1,486	500	34
Shapers			
Horizontal	31,461	20,841	66
Vertical, including Slotters	5,242	2,738	52
Threading Machines (except for pipe)			
Hobbing and milling	6,764	1,586	23
Die type	6,881	4,382	64
Tapping	17,985	6,318	35
Thread rolling	3,348	1,677	50
Other Machine Tools	44,122	32,619	74
GRAND TOTAL	1,711,137	652,185	38

10 MAJOR INDUSTRIES HAVE MORE OLD EQUIPMENT TODAY THAN IN 1930

DESPITE the production of over 1,000,000 new machine tools for domestic use since 1930, ten of the 20 major industrial groups today have a greater percentage of equipment over ten years old than they did in 1930. Of the remaining comparable groups, one group is now at the same status it was in 1930, while six others have a smaller percentage of equipment over ten years old today. Yet, these changes include government tools. Comparable data on the other three industries are not available.

The outstanding industrial development is the fact that the aircraft industry had 276,466 machines in its plants at the end of 1944, as against only 9,000 at the end of 1939. The natural explanation is the phenominal rise in aircraft production during that period. But the probability that the aircraft industry will shrink in size over the next few years indicates one segment of the metal-working industry from which a considerable number of surplus tools will be released. By far the bulk of its tools are government-owned, so that even after allowance is made for standby plants, large numbers of its tools will be declared surplus.

Another noteworthy development has been the excellent job that has been done by the War and Navy Departments in modernizing their arsenals and ordnance plants. Though this may have been dictated by wartime necessity, the fact remains that thousands of tools over ten years old have been cleared out of Army and Navy ordnance plants in the past few years.

Production Equipment

There has been a heavy increase in almost all types of machine tools, especially drilling machines, grind-

15-YEAR CHANGE IN MAJOR METAL-WORKING INDUSTRIES

INDUSTRY	PERCENT OF MACHINE TOOLS OVER 10 YEARS OLD				Change Since 1930
	1930	1935	1940	1945	
Agricultural Implements	55%	61%	67%	55%	+ 0
Aircraft and Aircraft Engines	4	12	28	2%	— 2
Motor Vehicles	28	54	62	40%	+ 12
Motor Vehicle Bodies and Parts	23	52	63	31%	+ 8
Construction, Mining and Oil Well Equipment	52	73	69	49%	— 3
Materials Handling, Power Transmission Equipment	12	70	74	54%	+ 12
Domestic Elec. Appliances and Equipment	46	60	69	47%	+ 1
Industrial and Commercial Electrical Equipment	X	63	69	47%	+ 1
Engines, Turbines and Water Wheels	51	79	71	25%	— 26
Consumers Fabricated Metal Products	44	70	74	55%	+ 11
Industrial Fabricated Metal Products				46%	+ 2
Processing and Servicing Machinery	46.5	72.5	69	56%	+ 9.5
Precision Mechanisms	X	X	60	36%	
Metal-Working Machinery and Equipment	X	70.5	73	45%	
Business Machines	73	73	67	62%	— 11
Army and Navy Arsenals	X	X	81Y	15%	
Heavy Equipment Not Elsewhere Classified	52	80	70	55%	+ 3
Railroad Equipment	73	71	82	42%	— 31
Job Shop Products	43	66	71	59%	+ 15
Textile and Clothing Machinery	62	72	76	58%	— 4
TOTAL STATUS	49	66	72	38%	— 11

X – Comparable data unavailable. Y – Army Arsenals only.

ing machines, lathes, and milling machines. But about one-third of this equipment is over ten years old, which will be a saving grace to the extent that the older equipment is replaced by newer machines. Even at that, some serious problems may arise.

With respect to production equipment other than machine tools, as listed in a special table on the accompanying large insert, big increases in total units in use have resulted from war requirements. This is particularly true in the case of welding and cutting machines, and cranes. The broadened uses of welding equipment, and the need for lifting equipment to handle munitions items account for this development. Broader uses for heat-treating units, parts washing and plating equipment are reflected in the over-all increases in the number of units in use. However, the status of welding and cutting equipment is outstanding in that only 15 percent of the units in use are less than 10 years old.

Results Standardized

In preparing its machine tool figures, the American Machinist has assumed the logical position of coordinating its figures with these of the War Production Board, which has issued considerable data on shipments, exports, orders, and so on. If any other basis were taken in this survey, then it would be impossible to reconcile it with official government data. For the convenience of our readers, back figures used in this survey have been adjusted to make comparisons easy.

Accordingly, attention is called to the fact that certain items have been removed from inclusion in the machine tool tables in this survey. Groups omitted from the machine tool tally include bending machines, forging machines, presses, riveting machines, swaging machines, shears, and welding machines. However, data on these items of production equipment are included in the smaller table appearing on the large folded insert with this section.

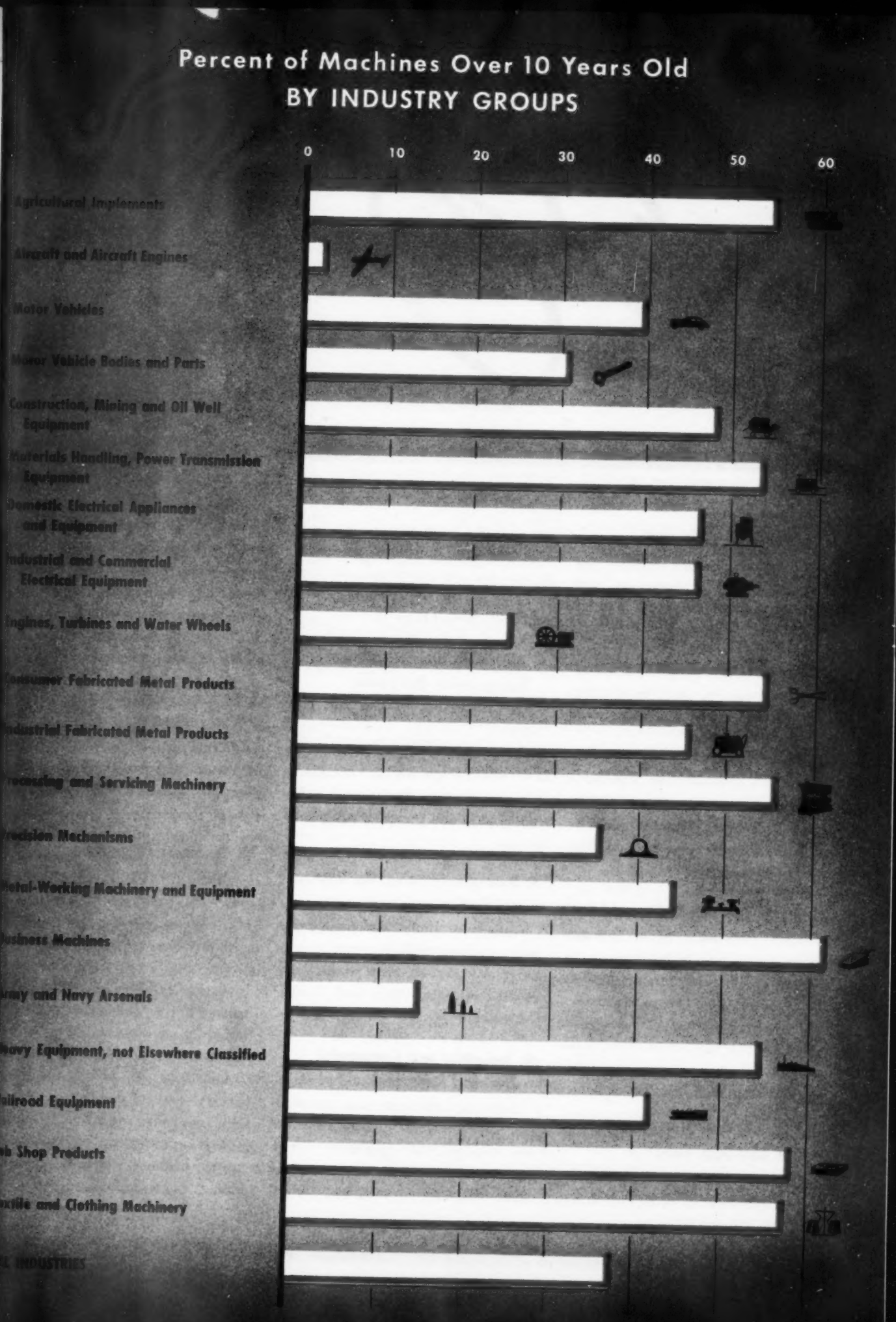
Group Changes

To enhance the value of these data, American Machinist has divided the "Fabricated Metal Products" group (which owned 36 percent of the metal-working equipment installed in 1940) into two groups: "Consumer Fabricated Metal Products" and Industrial Fabricated Metal Products. Our 1940 small groupings, "Food and Chemical Processing Machinery" and "Machinery Not Elsewhere Classified" have been combined into the logical grouping of "Processing and Servicing Equipment."

There have been minor additions to the products outlined under each major grouping. For example, plastics-moulding machinery manufacturers are now included in the "Processing and Servicing Machinery" group. One of the more important minor changes has been the shift of electric refrigerators from the "Domestic Electric Appliances" group to "Industrial Fabricated Metal Products". The change was made because other types of refrigerators than electrical units had previously been listed under "Industrial Fabricated Metal Products", and a continued separation of these refrigerator types would have complicated the proper allocation between both groups of the employees in plants producing these items. Since the information in this survey is partly based upon employment statistics, such adjustments are in the interests of adding to the overall accuracy of the survey.

MACHINE TOOL HOLDINGS BY MAJOR METAL-WORKING INDUSTRIES

INDUSTRY	TOTAL TOOLS	NUMBER OVER 10 YEARS OLD	PERCENT OVER 10 YEARS OLD
Agricultural Implements	31,632	17,293	55%
Aircraft & Aircraft Engines	276,466	5,261	2%
Motor Vehicles	176,616	69,883	40%
Motor Vehicle Bodies and Parts	67,071	21,214	31%
Construction, Mining, Oil-Well Equipment	41,089	19,916	49%
Materials Handling, Power Transmission Equipment	56,808	30,342	54%
Domestic Electrical Equipment	45,568	22,182	47%
Industrial Electrical Equipment	105,096	49,824	47%
Engines, Turbines and Water Wheels	26,939	6,696	25%
Consumer Fabricated Metal Products	96,943	51,808	55%
Industrial Fabricated Metal Products	293,120	132,030	46%
Processing & Servicing Equipment	58,958	33,042	56%
Precision Mechanisms	84,042	29,899	36%
Metal-Working Mach. and Equipment	91,430	40,894	45%
Business Machines	17,303	10,643	62%
Army and Navy Arsenals	44,670	6,637	15%
Heavy Equipment	106,457	58,152	55%
Railroad Equipment	37,304	15,528	42%
Job-Shop Products	17,235	10,034	59%
Textile and Clothing Machinery	36,386	20,907	58%
TOTAL ALL INDUSTRIES	1,711,137	652,185	38%


Percent of Machines Over 10 Years Old
BY INDUSTRY GROUPS
0
10
20
30
40
50
60
Agricultural Implements
Aircraft and Aircraft Engines
Motor Vehicles
Motor Vehicle Bodies and Parts
Construction, Mining and Oil Well Equipment
Materials Handling, Power Transmission Equipment
Domestic Electrical Appliances and Equipment
Industrial and Commercial Electrical Equipment
Engines, Turbines and Water Wheels
Consumer Fabricated Metal Products
Industrial Fabricated Metal Products
Processing and Servicing Machinery
Precision Mechanisms
Metal-Working Machinery and Equipment
Business Machines
Army and Navy Arsenals
Heavy Equipment, not Elsewhere Classified
Railroad Equipment
Job Shop Products
Textile and Clothing Machinery

PRODUCTS MANUFACTURED BY THE 20 INDUSTRIAL GROUPS

1. Agricultural Implements

Harrowing, plowing, planting, cultivating, irrigating, harvesting and threshing machinery, lawn mowers, tractors and tractor engines.

2. Aircraft and Aircraft Engines

Aircraft engines, parts, except electrical parts and tires, complete aircraft.

3. Motor Vehicles

Ambulances, chassis, fire department apparatus, hearses, motorcycles and side cars, motor buses, passenger vehicles, taxicabs and other commercial vehicles, trucks and truck tractors.

4. Motor Vehicles Bodies and Parts

Bus bodies, parts (axles and axle shafts, brakes and brake parts, bumpers, oil and air filters, frames, heaters, horns, instrument board assemblies, piston rings, propeller shaft assemblies, radiators, rear axle attachments, transmissions, wheels); passenger car bodies, trailers, truck and commercial bodies.

5. Construction, Mining and Oil Well Equipment

Cement and concrete machinery, cranes and derricks, dredging, excavating and road building machinery, mining machinery, oil-refinery machinery, miners' and contractors' portable pneumatic tools, stone-working machinery, well-drilling machinery.

6. Materials Handling, Power Transmission Equipment

Air compressors, blowers and fans, conveying machinery, elevators, industrial and mining cars, trucks and tractors, power transmission equipment (chains, sprockets, gears, speed reducers), pumps and pumping equipment, stokers.

7. Domestic Electrical Appliances and Equipment

Household appliances, phonographs and accessories, radio-phonograph combinations, radio receivers, washing machines, wringers, driers and ironing machines.

8. Industrial and Commercial Electrical Equipment

Batteries; commercial radio transmitters and receivers; electrotherapeutic and electromedical apparatus, including X-Ray; generators and motor-generator sets; heating units and devices, except industrial furnaces and ovens; miscellaneous radio equipment; motors, except railway; fans and control apparatus, except railway and vehicle; rectifying apparatus; switchboard apparatus; transformers, reactors and voltage regulators; wiring devices and supplies.

9. Engines, Turbines and Water Wheels

Internal combustion engines, except aircraft, railway and tractor; steam engines and turbines; water wheels and turbines.

10. Consumer Fabricated Metal Products

Bicycles; children's carriages and other wheel goods, sleds and skates; collapsible tubes; cutlery (table cutlery, scissors, shears, snips, clippers, razors, dry shavers, razor blades, pocket knives, butcher knives and cleavers); Furniture, including store and office fixtures; household kitchen tools; heating and cooking apparatus, except oil and gas burners; jewelry and jewelers' materials; mechanical pencils and pens; musical instruments, including organs, cup-mouthpiece instruments, saxaphones, and accessories; needles, pins,

hooks and eyes, slide and snap fasteners; silverware and plated ware; toys and games; watch cases; and similar miscellaneous items.

11. Industrial Fabricated Metal Products

Aluminum products, except electrical appliances; bolts, nuts, washers and rivets; dentists' burrs, drills, hand instruments, sterilizers and equipment units; doors, shutters, window sash and frames, molding and trim; drawing instruments; flexible metallic tubing and hose; fire extinguishers; gold leaf and foil, tin and other foils; hand tools (agricultural edged hand tools, axes, adzes and hatchets, augers and bits, gimlets and countersinks [wood-working only], chisels, except cold chisels, gages, dies for cutting cloth, paper, leather, draw-knives and spoke-shaves, files, forks, hoes, rakes, shovels, saws, mechanics' hand tools); hardware not elsewhere classified; lighting equipment, except incandescent bulbs; miscellaneous, including air conditioning equipment, barn equipment, gas generators, sprinkler systems, etc.; motor scooters; nails and spikes; nonferrous metal products not elsewhere classified; playground equipment; plumbers' supplies (enameled iron sanitary ware, tanks and shells for water heaters, range boilers, plumbers' brass goods); refrigerators and refrigerating and ice-making apparatus, commercial and industrial; screw machine products and wood screws; sheet metal work not elsewhere classified; springs; stamped and pressed metal products; surgical instruments, tin cans and other tinware not elsewhere classified; valves, faucets and fittings; water filters and softeners; wheelbarrows; wire drawn from purchased rods and fabricated wire products; wirework not elsewhere classified; also, some partly non-metallic parts and products in this category.

12. Processing and Servicing Machinery

Bakers' machinery; beauty shop machines; bottling machinery; coffee roasting and grinding machinery; clay-working machinery; coin-operated machines; canning machinery; confectionery and ice cream machinery; dairy machinery; dish-washing machines; flour-mill and grain-mill machinery; food choppers and grinders, mixers, slicers, etc.; glass-making machinery; laundry machinery, commercial; leather-working machinery; Oil-mill machinery; packaging machinery; paint-making machinery; paper-mill and pulp-mill machinery; pharmaceutical machinery; paper container machinery; plastic-moulding machinery; presses, other than metal-working; printers' machinery and equipment; pulverizers, fuel and others; rubber-working machinery; tobacco-products-making machinery; sugar-mill machinery; woodworking machinery.

13. Precision Mechanisms

Ball and roller bearings; cameras, including motion pictures; clocks, watches and time recording devices, including electric clocks; firearms; fishing rods and reels; flow indicating, recording and controlling equipment, including gas, water and electric meters; instruments, meters and relays, electric; machinery and mechanism parts and attachments not elsewhere classified; nautical and navigation instruments; oil and gas burners, except boilers and furnaces; optical instruments; other metal instruments and apparatus; pressure indicating, recording and controlling equipment; projectors and other optical apparatus; pyrometers; safes and vaults; scales and balances; speedometers; surveyor's instruments; tachometers.

14. Metal-Working Machinery and Equipment

Foundry machinery; furnaces, heat-treating and other industrial types; machine tools, including bending machines; machine tool accessories, including cutters; machinists' precision tools; other metal-working machinery; precision measuring tools; welding apparatus, gas and electric.

15. Business Machines

Adding and calculating machines; cash registers; typewriters.

16. Army and Navy Arsenals

Rifles; small arms; medium and major calibre guns; coast defense and anti-aircraft guns; gun carriages; ammunition; fuses; explosives; fire-control instruments; tanks.

17. Heavy Equipment not Elsewhere Classified

Boiler shop products; cast iron pipe and fittings; cold-finished bars and strips; fabricated pipe; forgings; foundry products; ship building and repairing; steel barrels, kegs and drums; structural and ornamental metal work; wrought pipe, welded and heavy riveted.

18. Railroad Equipment

Cars, electric and steam railroad, including self-propelled; locomotives; railway car engines; repair work on above.

19. Job Shop Products

General jobbing and machine shop work, including repairing and experimental.

20. Textile and Clothing Machinery

Clothes-pressing machinery; sewing machines and attachments; shoe machinery; textile machinery and parts.

PACIFIC COAST'S TOOLS HAVE *Tripled* SINCE 1940

AN ANALYSIS of the geographical distribution of machine tools reveals that the West Coast's holdings have more than tripled since 1940. The dispersion of war plants for security reasons and the expansion of aircraft plants and shipyards in that area, account for the rise in the number of tools in the Pacific Area, and also for the relatively small ratio of tools (29 percent) over 10 years old.

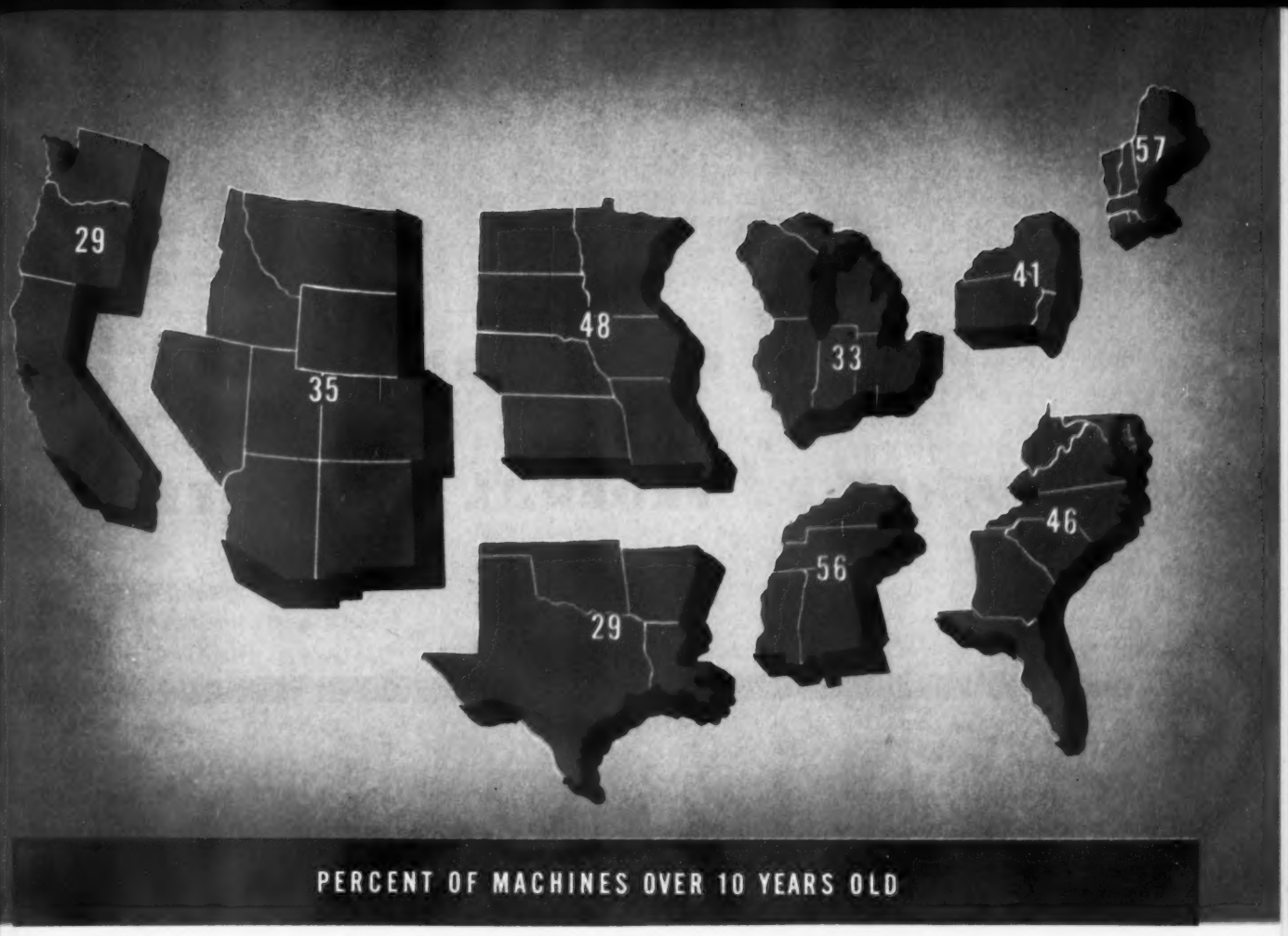
To a lesser degree, dispersion of war production has increased machine tool holdings in the South and Southwest. In postwar years, this efficient equipment may enable those areas to substitute peacetime industrial activities for their war plants, since the favorable effect of fairly new equipment upon production costs may offset other factors, such as distance from raw materials.

The nation's most highly indus-

GEOGRAPHICAL DISTRIBUTION OF MACHINE TOOLS

AREA	MACHINES IN PLACE	MACHINES OVER 10 YEARS OLD	PERCENT OVER 10 YEARS OLD	AREA SQ. MILES	MACHINES PER 100 SQ. MILES	POPULATION 1,000	MACHINES PER 1,000 POPULATION
NEW ENGLAND ..... Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut	203,239	114,959	57%	66,424	305.9	8,392	24.2
MIDDLE ATLANTIC ..... New York, New Jersey, Pennsylvania	361,621	147,762	41%	102,554	352.6	26,558	13.6
SOUTH ATLANTIC ..... Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida	52,671	24,444	46%	282,910	18.6	19,278	2.7
EAST NORTH CENTRAL ..... Ohio, Indiana, Illinois, Michigan, Wisconsin	869,867	286,767	33%	248,105	350.6	26,411	32.9
EAST SOUTH CENTRAL ..... Kentucky, Tennessee, Alabama, Mississippi	9,306	5,209	56%	181,483	5.1	10,817	0.9
WEST NORTH CENTRAL ..... Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas	76,588	36,718	48%	518,379	14.7	12,774	5.9
WEST SOUTH CENTRAL ..... Arkansas, Louisiana, Oklahoma, Texas	19,716	5,730	29%	437,794	4.5	13,564	1.5
MOUNTAIN ..... Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada	7,335	2,533	35%	865,017	0.9	4,413	1.7
PACIFIC ..... Washington, Oregon, California	91,633	26,242	29%	324,123	28.2	11,735	7.8
TOTAL*	1,691,976	650,364	39%	3,026,789	55.9	133,942	12.6

*Excludes Navy Ordnance tools



PERCENT OF MACHINES OVER 10 YEARS OLD

trialized sections continue to be the New England, Middle Atlantic and East North Central areas, where the development of industry was the natural result of nearness to raw materials, such as coal and iron ore, and proximity to large markets in heavily populated regions. It is notable that in the East North Central area only 33 percent of the machine tools are over ten years old (although this record is made possible by the government-owned equipment in that area). In New England 56 percent of the tools are over 10 years old, a poorer showing than the other two major industrial areas.

On an over-all basis, the large number of tools produced since 1940 have brought the nation to a point where it now has 55.9 machines per 100 square miles, and 12.6 machines per 1,000 population. The Pacific area has a ratio of 7.8 machines per 1,000 persons, despite the heavy migration to the West during the war and the intensified industrialization there. The relative position of that area, therefore, is behind that of the three major industrial areas. However, the Pacific area ranks higher in number of tools installed than either the South Atlantic area or the West North Central Area, whereas it fell below those areas in 1940. This trend may indicate a fundamental change in the nature of the nation's economy.

Important Qualifications

The geographical division in the accompanying large table, and other exhibits, are only approximate divisions of the nation's equipment based upon survey returns, and should not be considered as exact distributions. It should be further noted that Navy Ordnance holdings were excluded from the national geographical distribution, since they were received too late for this purpose. However, the relatively small number involved in relation to the large national total does not substantially change the over-all geographical picture.

Direct comparisons between the geographical groupings of machine tool holdings in American Machinist's 1945 survey with its 1940 survey cannot be made, since the 1940 survey includes certain items, such as bending machines, forging machines, presses, swaging machines, riveting machines, shears, and welding and cutting machines, which have been omitted from the 1945 geographical groupings. Data on such non-machine-tool production equipment may be found in the large master table accompanying this issue.

A more detailed geographical distribution by machine types will be found in one of the large tables on the folded insert.

1/3 OF NATION'S TOOLS OWNED BY FEDERAL AGENCIES

DESPITE the all-important influence of government-owned tools upon the nation's postwar economy, no accurate information about government holdings is at hand. The truth is that no one yet knows how many machines the government owns, what they are, where they are and in what condition they are.

600,000 Tools Owned

The most reliable estimate places the figure around 600,000 units, in contrast to the 724,275 total indicated in the table on this page. However, of this latter figure it is believed that some 125,000 of the Navy's listings include non-metal-working tools and production equipment, instead of machine tools. This is based upon a study of government data indicating the approximate value of tool shipments to the Navy, plus addition of some items over 10 years old still held by the Navy.

The 600,000 or more tools owned by government agencies pose problems in plant clearance, decisions on standby government plants for security and other reasons, and surplus tool disposal. Location of some of these tools and plants in areas distant from potential buyers involves further serious considerations.

Releases To Be Slow

But it will be a long time before the entire tool surplus is made available. An Army official recently stated that the 123,000 tools the War Department will dispose of after the war will be released at the rate of 15,000 within 60 days after VE Day, and that over the following four months some 5,000 monthly will be declared surplus. This means that only 35,000 of the Army's tools may be released within a six-months' period, representing about 26 percent

PRELIMINARY ESTIMATES OF GOVERNMENT OWNED TOOLS

AGENCY	TOTAL OWNED	OVER FIVE YEARS OLD	WILL RETAIN POSTWAR
War Depart.	162,579	15,897	39,061
Navy Depart. (Y)	254,706X	62,807X	118,356X
DPC	285,000	N.A.	N.A.
Maritime	22,000	N.A.	N.A.
TOTAL	724,275	78,704	157,417

X—Includes furnaces, welding equipment, some woodworking equipment, and machinery at Pearl Harbor, in addition to machine tools in the Continental United States.

Y—Navy also plans to acquire 23,177 additional tools for postwar retention.

N.A.—No data available.

SOURCE: *Data submitted before Senate Small Business Committee hearings April 25-26, 1945.*

of its total holdings. Release of the balance will be intensified after Japan's defeat.

The Navy has indicated that only the Bureau of Ships is likely to declare tools surplus in any amount prior to the end of the war with Japan. The Bureau of Ships holds about 60 percent of the Navy's total units, so that when it starts to make releases during the latter half of 1945, the number involved may be relatively large. The Navy Bureau of Aeronautics and Bureau of Ordnance are reported not prepared to make releases until after the end of the war with Japan.

The Defense Plant Corporation, which is the largest holder of machine tools, and the Maritime Commission will probably make gradual releases from now until the end of the war as various government facilities become idle.

From the standpoint of number of tools, the Army expects to release over 100,000 of its tool holdings, the Navy may release some 65,000 machine tools, DPC may dispose of the bulk of its 285,000 holdings, while the Maritime Commission may dispose of most of its 22,000 tools. This would indicate the eventual disposal of some 450,000 or more in government-owned tools.

The appended table on Defense Plant Corporation tool holdings is somewhat dated, for DPC has since increased its holdings to 285,000. However, it permits a comparison of a major portion of the government's holdings by types to the national summary. Naturally, the types of tools held by the Army, Navy, and Maritime Commission will take a different pattern.

SUMMARY OF DEFENSE PLANT CORPORATION PRELIMINARY SURVEY OF MACHINE TOOLS LOCATED IN THE UNITED STATES

MAJOR TYPES	UNITS	MAJOR TYPES	UNITS
Boring Mills	7,985	Polishing and Buffing	8,802
Broaching Machines	894	Cut-off and Sawing	6,318
Drilling Machines	44,440	Rifling Machines	212
Gear-cutting and finishing	8,936	Tapping and Threading	3,969
Grinding Machines	61,499	Centering Machines	325
Lathes	47,921	Other Machines	9,770
Milling Machines	26,663	Rentro-lease	1,029
Planers	828	Machine Tool Pool	900
Shapers and Slotters	2,348		
Keyseating	117		
Honing and Lapping	4,049	GRAND TOTAL	239,037

MACHINE TOOL SHIPMENTS SINCE 1901

YEAR	ESTIMATED YEARLY SHIPMENTS*	YEAR	ESTIMATED YEARLY SHIPMENTS
1901	$17,900,000	1923	$79,300,000
1902	22,800,000	1924	69,600,000
1903	23,700,000	1925	86,700,000
1904	18,300,000	1926	105,000,000
1905	28,700,000	1927	87,000,000
1906	36,400,000	1928	128,000,000
1907	41,300,000	1929	185,000,000
1908	16,800,000	1930	96,000,000
1909	33,500,000	1931	51,000,000
1910	44,300,000	1932	22,000,000
1911	32,800,000	1933	25,000,000
1912	44,400,000	1934	50,000,000
1913	44,600,000	1935	85,000,000
1914	35,300,000	1936	133,000,000
1915	103,400,000	1937	195,000,000
1916	141,400,000	1938	145,000,000
1917	168,500,000	1939	200,000,000
1918	220,600,000	1940	440,000,000
1919	161,000,000	1941	775,000,000
1920	151,500,000	1942	1,320,000,000
1921	36,000,000	1943	1,179,800,000
1922	43,300,000	1944	501,548,000

SOURCE: War Production Board and National Machine Builders Association

HOW THE *Inventory* WAS TAKEN

TO SECURE adequate data for its Five-Year Inventory, American Machinist mailed out questionnaires and letters to 22,000 metal-working companies all over the United States and in all segments of the metal-working industry. A special effort was made to obtain figures from the larger as well as the smaller companies. Returns came in from companies employing tens of thousands of workers and from those having a mere handful. In this way the representative character of the survey as a true index of the nation's equipment was insured. Supplementing the data from private manufacturers was information supplied by the Army and Navy regarding arsenal and ordnance plant equipment.

After the data had been coordinated, the results were compared with available indicators as a double-check on accuracy. To be specific, machine tool shipments from 1940 to 1944 inclusive totaled $4,046,348,000. Of that amount, about 18 percent were sent abroad. Against the $728,422,000 of machine tools exported was put a figure of $6000 per unit (because a large number of these machines were high-value special machines for Great Britain and Russia). By simple arithmetic, it was found that 121,404 machine tools had been sent overseas during 1940-44.

Machine tool production in the same five-year period was 948,835 units, according to government and industry figures. If exports are deducted, the machine tools built in the United States the last five years and installed here number 827,431 units. By similar means, American Machinist determined that 140,000 machine tools were produced for domestic customers from 1935 to 1939 inclusive. By adding the total for the past five years to that for the previous five years, one finds that 967,431 machine tools less than ten years old should be in place in the metal-working industries at present.

It would seem disconcerting, thus, to know that the 1945 survey indicates 1,058,952 machine tools under ten years of age installed in this country. The difference of 91,521 units thus disclosed (1,058,952 minus 967,431) is explained by three factors: (1) several thousand machine tools were imported from Canada during the war years; (2) a considerable number of machine tools shipped abroad under lend-lease have been returned to the United States; and (3) thousands of machine tools have been made in the country's tool rooms over the past decade in conformity with a long-time practice.

Certain apparent inconsistencies crop up in examining statistics of machine tools over ten years old. The survey reveals 652,185 units over ten years of age in metal-working plants. On the other hand, there were 723,947 units in that classification in 1940; and from 1940 to 1944 about 40,000 additional machines went over the ten-year-age limit. The natural conclusion from this relationship might be that 110,000 machine tools were scrapped or broken during the past five years. Actually, some of the drop in number of machine tools over ten years old in the hands of metal-working industries is due to: (1) exports of used equipment over the past five years, although specific data is not available; and (2) non-metal-working industries have been active buyers of old equipment for their maintenance shops, because they did not have priorities with which to purchase new machines.

Compiling The Data

Thousands of metal-working companies supplied data about the total number of machines in place in their plants and the number over ten years old divided according to the classifications on the accompanying large statistical table. In addition, manufacturers recorded on the questionnaires their principal peacetime products and the number of wage earners as of December, 1944. The number of wage earners represented by the returns in each industrial subdivision gave an indication of the coverage provided in that group when compared with the industry's total employment in December, 1944, as reported by the U.S. Department of Labor. By simple division an extension factor was obtained.

If it was found, for example, that the Labor Department's employment figures showed 67,800 wage earners making "engines, turbines, and water wheels", while the questionnaires received from this group covered plants employing 13,560 wage earners (or one-fifth of the industry's total), a factor of 5 was applied to the machines reported by the returns in arriving at the final totals for use in the survey summary.

THE NATIONAL MACHINE TOOL PICTURE SINCE 1930

YEAR	TOTAL TOOLS IN PLACE	NUMBER OVER 10 YEARS OLD	PERCENT OVER 10 YEARS OLD
1930	1,127,310	554,562	49%
1935	1,068,923	709,074	66%
1940	1,000,112	723,947	72%
1945	1,711,137	652,185	38%

NOTE: Includes items identified as "Machine Tools" by the War Production Board in its regular data. Excludes such non-tool items as sheers, riveting machines, swaging machines, bending machines, forging machines, and presses. Back figures adjusted to make all data comparable.

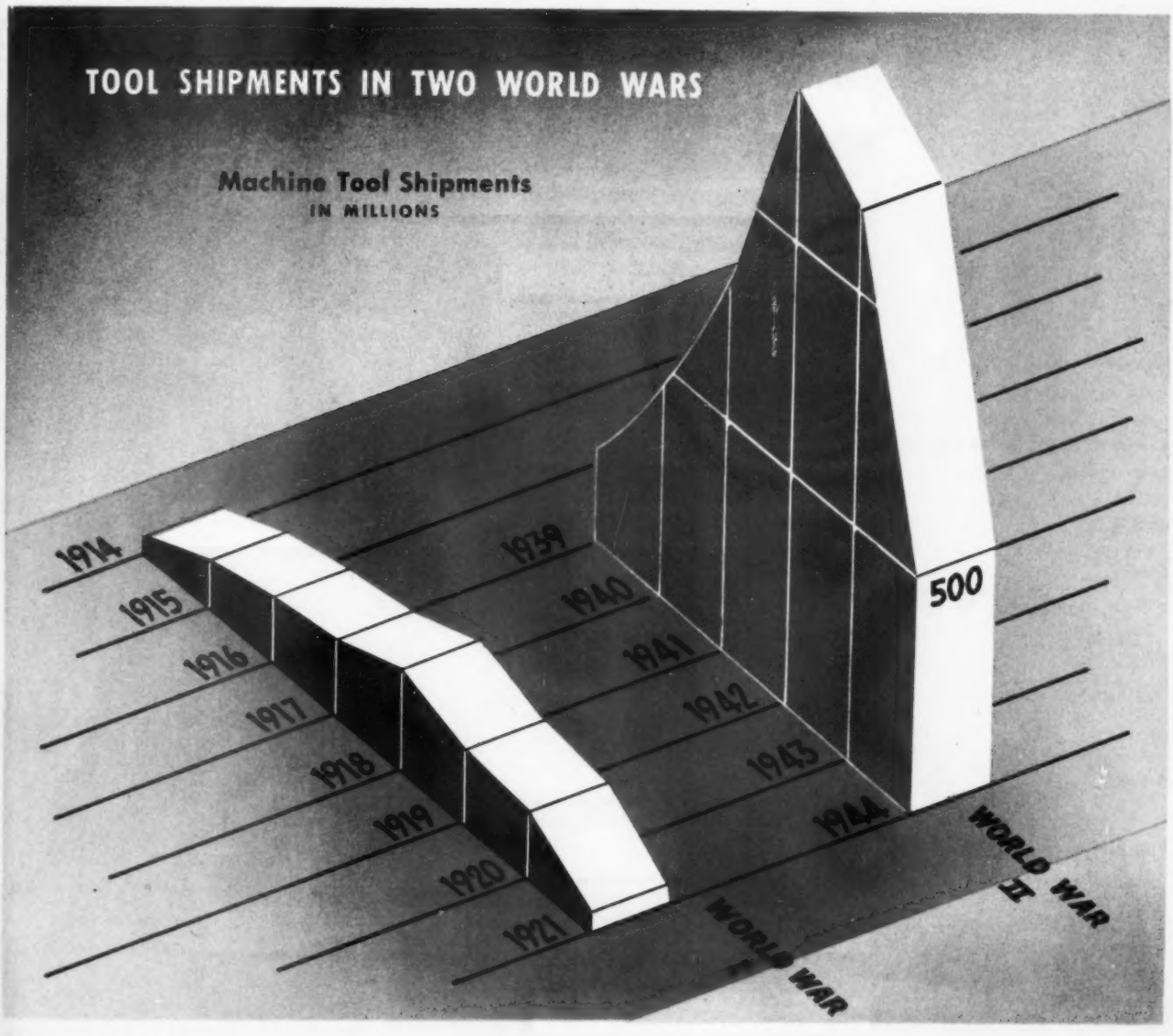
SOURCE: *American Machinist surveys.*

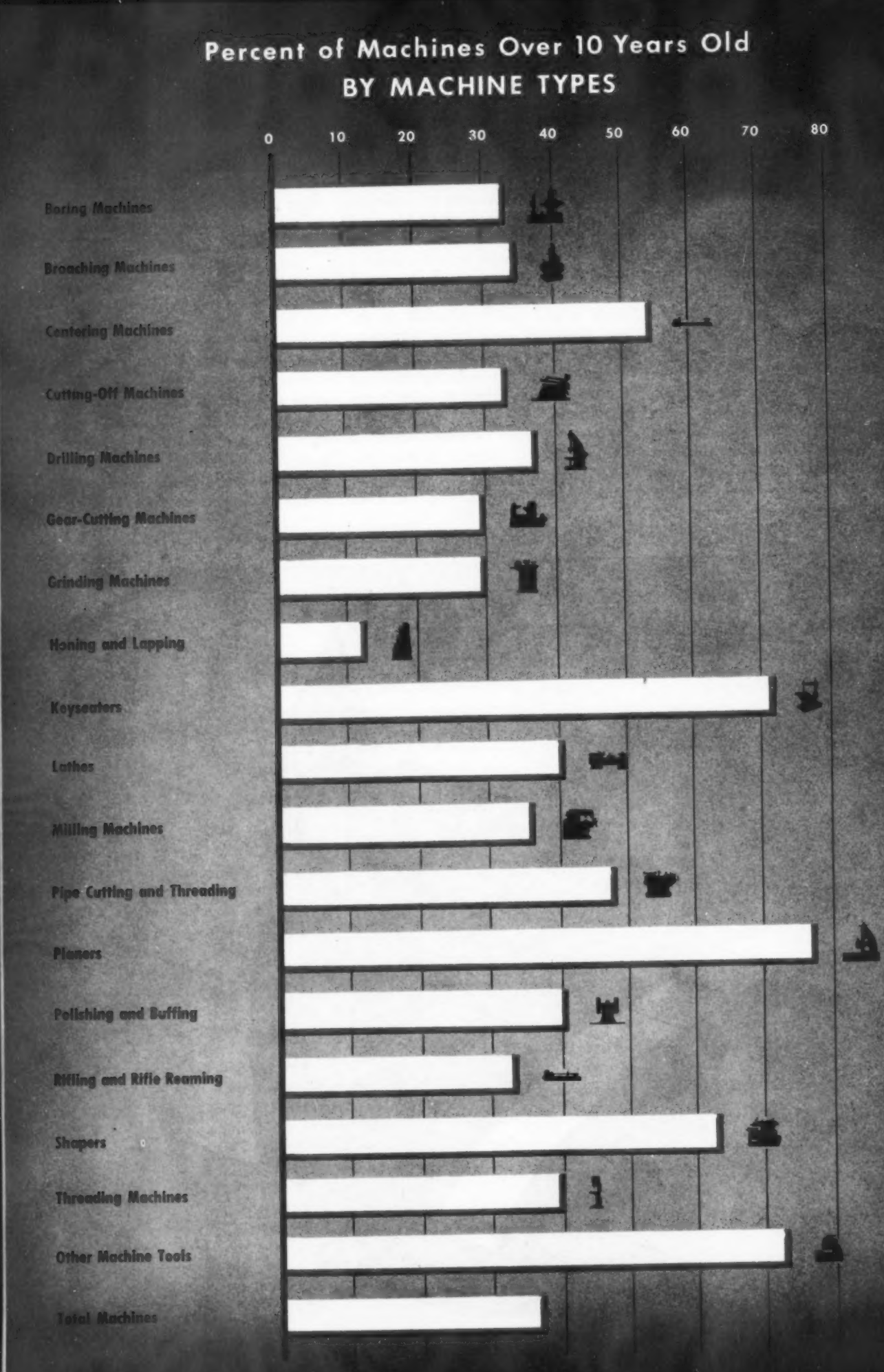
The use of this extension factor assumed that, for a given industrial division, the ratio of men to machines is substantially constant. More returns were received, of course, from some industrial subdivisions than from others, so that the degree of adjustment of each group varied. This method of computation, however, gives the proper weight to all groups by extending the returns for each subdivision according to the proportion of the industry represented by them.

Thus weighted, the figures were combined first by industrial groups and then by geographical divisions. The figures shown for Army and Navy Arsenals are actual totals as reported to American Machinist by the Ordnance Department of the War Department and the Navy Department's Bureau of Ordnance. They represent the metal-working equipment contained in such arsenals and ordnance plants, but do not include machines owned by other departments and bureaus of the Army and Navy or machines owned by the Army and Navy located in private industry's plants. The inclusion of this latter equipment would result in duplication, since it was already reported on the questionnaires returned by privately-owned plants, and allowance for its operation has been made in adjusting the wage earner figures for each industrial group.

Since American Machinist began its five-year surveys in 1925, it has been asked repeatedly why it noted the amount of equipment "over ten years old", instead of setting some other standard for obsolescence. To avoid any misunderstanding, American Machinist wishes to point out that whether a machine falls on one side or other of the ten-year mark does not necessarily determine its usefulness.

The ten-year figure was chosen arbitrarily as a measuring stick to put alongside metal-working equipment to find out its comparative age. It is fully recognized that some types of equipment over ten years old are still highly useful and should not be replaced merely because of their age. At the same time, American Machinist realizes that much equipment under ten years of age already is obsolete in that newer and more efficient machinery has been developed to do the same work.




Percent of Machines Over 10 Years Old
BY MACHINE TYPES
0
10
20
30
40
50
60
70
80
Boring Machines
Broaching Machines
Centering Machines
Cutting-Off Machines
Drilling Machines
Gear-Cutting Machines
Grinding Machines
Honing and Lapping
Keyseaters
Lathes
Milling Machines
Pipe Cutting and Threading
Planers
Polishing and Buffing
Rifling and Rifle Reaming
Shapers
Threading Machines
Other Machine Tools
Total Machines

Parts of Laminated Plastic Sheets Formed by Thermoelastic Method

BY ROBERT L. WHANN, ENGINEER, NORTH AMERICAN AVIATION, INC.

Simple hot-working technique in forming laminated plastic sheet produces airplane parts that are lighter in weight and often less costly than those made of metal

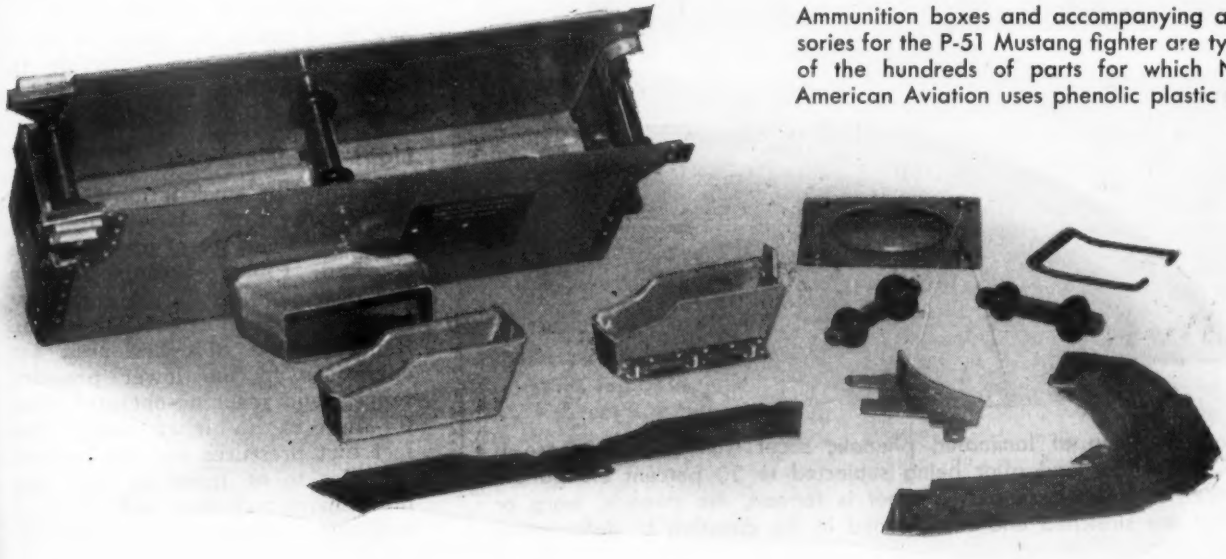
FLAT laminated sheets of thermosetting plastic materials, in the cured state, can be formed into shapes quite similar to those into which the ordinary lighter sheet metals are formed, and by methods which somewhat resemble those used for forming such sheet metals.

Development of a technique for forming these laminates, called thermoelastic forming because the plastic sheet is pre-heated, has enabled North American Aviation, Inc., to use literally hundreds of formed plastic parts in its B-25 Mitchell bomber, and in its P-51 Mustang fighter plane. Their use has made an important weight saving in those airplanes, more than a hundred pounds, thus improving their performance, and at a cost that is not higher—in fact, often lower—than would be the cost of the corresponding part in sheet metal.

Since the thermosetting plastics are those which are, by definition, resistant to heat, their susceptibility to being formed by a process of hot-working, after the plastic resins have been "set" by curing, appears to contradict the definition. The answer is that the heat-resistant plastics are only relatively so, and raising their temperature does, in fact, soften them, thus permitting them to be worked, formed and drawn. There are limitations on the process, but these are not such as to prevent it from having many practical applications.

In airplanes, these formed plastic parts have been used only as non-structural or semi-structural elements. Examples of some of these uses are shown in the accompanying photographs. For such uses, these parts have several advantages other than the paramount one of being lighter. They will, for example, withstand abrading impact, kicks and scuffs, better than the comparable sheet metals, and they are generally less sensitive to vibration. Labor required for the actual forming process is usually less than for sheet metals, and simpler and cheaper tooling can be used—factors which often more than offset the higher cost of the material itself.

Generally, all commercial phenolic laminated sheets, of thicknesses of ¼ in. or less, have been



Ammunition boxes and accompanying accessories for the P-51 Mustang fighter are typical of the hundreds of parts for which North American Aviation uses phenolic plastic sheet

formed more or less successfully by North American Aviation. Naturally, materials of varying composition vary also in formability. In general, it appears that stocks made of highly plasticized resins, or those resins that contain aniline formaldehyde, are less suitable, in one way or another, than those whose resins are of the phenol or cresylic acid mixture type.

Fully cured stock gives better results than under-cured. In fact, over-cured stock, which has been subjected to higher temperatures and pressures than those normally used for curing, is better than under-cured stock, although both are inferior to stock in the normal cured (C) condition. Under-cured stock was tried in the mistaken belief that full cure might result from the heat and pressure applied during the forming process, but the resulting parts lacked stability and rigidity.

Formability also depends on the nature of the laminate, the reinforcing material embedded in the resin. All of the fabric laminates commonly used, ducks, twills, herring weaves, give good results, and selection of one of them should be made on the basis of desired physical properties, and the severity of the forming involved.

TABLE I

(1/16 in. Thick Material)

Heating Period (Minutes)	Temp. of Oven
2.75—3.0	350
2.0 —2.25	400
1.0 —1.20	450
0.9 —1.0	500

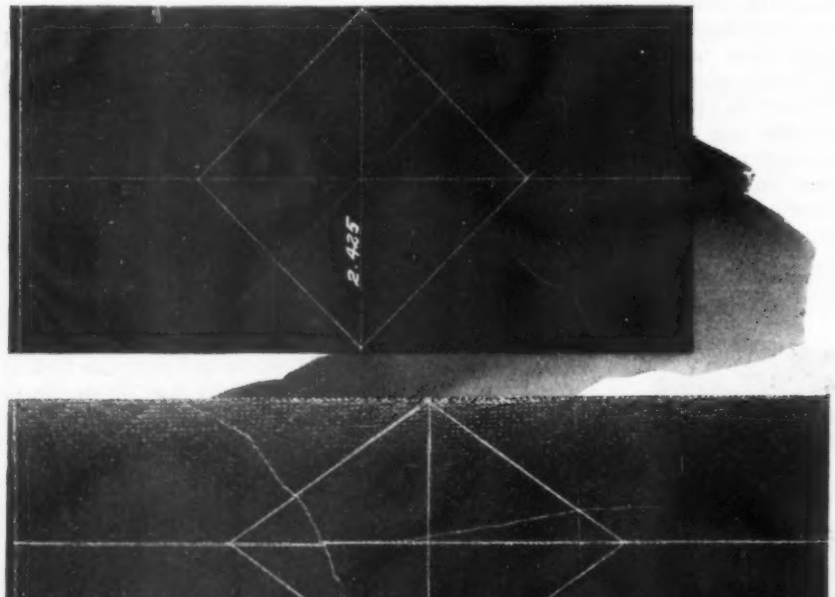
TABLE II

Material Thickness (In.)	Heating Period (Minutes)	Minimum 90 deg. Bend Radius* (In.)
1/16	0.9—1.0	1/8
3/32	1.2—1.5	1/4
1/8	1.3—1.7	3/8
5/32	1.5—2.0	5/8
1/4	2.5—4.0	1

*Average conditions for most fabric base laminates.

In the forming process, the threads of the laminating fabric are stretched, straightened, or relocated according to the intensity and direction of the force applied. It is this ability of the laminate to assume varied shapes, in which it is held by the resin when the latter has resumed its original brittle cured condition, that makes the process possible. Interestingly enough, the process of forming often enhances the physical properties of the sheet stock, due to the fact that the threads of the fabric are straightened from the crimped position into which they were originally woven. The extent to which fabrics can be distorted without failure, and therefore the limit of formability of a fabric-base plastic sheet, is much greater than might be supposed, and elongations of 15 to 20 percent are not uncommon. However, the method of working plastic sheet is of as great importance as its composition, and, in particular, the temperature to which the sheet is heated is quite critical in obtaining maximum plasticity. Of the several heating methods that may be used, that of pre-heating the blank in a gas-fired oven with forced circulation of air has been found to be the most satisfactory. The furnace should be located conveniently near the forming tools so as to avoid undue loss of temperature when the heated blank is transferred from the oven to the forming tools. Practice is to place a cold blank in the oven each time that a heated one is withdrawn for working, with the total number of blanks in the furnace at any one time being varied according to the length of the heating cycle.

Tables I and II show the temperatures and heating times that have been found to be generally satisfactory. These values are merely those that have been found to be satisfactory, and should not be regarded as limiting or conclusive. The data given in the tables, and particularly those for minimum 90 deg. bend radius for sheets of various thicknesses, are applicable to most fabric-base materials under average conditions.



Test specimen of laminated phenolic sheet with a fabric base is shown before and after being subjected to 20 percent elongation. When a fabric-base plastic sheet is formed, the threads, warp or filler are stretched and straightened in the direction of deformation

Light Materials for Dies

Because the stock is quite soft at the temperature at which it is worked, no very great pressures are required. Pressures range from a low of around 10 lb. per sq. in. to a high of around 100 lb. per sq. in. Hand-operated dies are used for operations in the lower pressure ranges, and machine-operated dies, for those in the higher ranges. The fact that pressures are low permits the dies to be made of light and inexpensive materials such as wood, masonite, kirksite, or of plastics

Hand-operated dies for forming small plastic parts are placed on a 10-ft. revolving table adjacent to the oven in which blanks are pre-heated. In the background are three presses used for heavier forming operations

with fabric or paper laminates. The low cost of such tooling is a very important factor — costwise — especially for short runs.

Dies operated by hand, with the lower pressures, are used for the simpler shapes that require only bends. If several bends in different planes are required, multiple-acting dies are used so that the work can be done in substantially one operation. In dies of this kind the several required elements are compounded into one fixture, with provision for applying pressure in the required number of directions. Usually in hand-operated dies this is done by one or more toggle clamps for applying and holding the required forming pressure. An arrangement of a group of hand dies on a revolving table has been found useful, inasmuch as it permits the particular die that is being used to be brought conveniently close to the heating furnace.

Machine-operated dies are used for the operations such as beading, flanging or drawing that require more pressure. Small pneumatic presses are most frequently used by North American Aviation for this type of work. Typically, these dies are multi-stage tools, so built that the pressure applied for an initial stage of forming is held while subsequent operations are done. In these dies, as in those that are hand-operated, the work is held in the die, under pressure, until it has cooled enough to be removed safely. Dies in use on presses are oiled with paraffin oil twice a day to promote the smooth sliding of the stock that is essential for these relatively severe operations. However, the press work involved is relatively simple.

Conventional Tools Used

Likewise, no special equipment or procedures are needed for either the pre-forming or the after-forming fabricational work on plastic parts. Conventional tools are used for riveting, machining and assembly of such parts, and drill and assembly jigs of the types used in ordinary sheet-metal work are used, and in the same manner. Blanks from which parts are to be formed are cut from sheets of stock by multiple sawing or routing, in the usual manner. At North American Aviation a centralized unit of the factory is devoted to the handling of plastic parts, the preparation of blanks, the forming, and after-forming work.

Another advantage of plastic parts is that generally no protective finish is needed. The smooth resinous finish of the parent stock is neither crazed nor broken, and the part can be used in its natural state without further processing.

Generally, springback of formed parts, although present in varying amounts, depending on the shape of the part and the nature and thickness of the material, is not a serious problem. No specific solution is suggested for the springback problem, when it is a problem, other than that of making an allowance for it in the construction of the die as is usually done in the fabrication of metals.

Exploration of the possibilities of this most promising field is as yet far from complete, so that no authoritative list of "do's and don'ts" can be given, but it is certain that the simplicity and ease of the procedure materially widens the field of applications of plastics.

Some Facts About Master Gears

BY G. H. SANBORN, CHIEF FIELD ENGINEER, FELLOWS GEAR SHAPER COMPANY

MASTER GEARS are used, and properly so, for the inspection of different types of gears at various stages of their production and after completion. By running a master gear with a production work gear, under proper radial pressure, one can tell whether the work gear is capable of running smoothly or not. It will also tell whether the teeth are concentric with the bore or other points of mounting. By noting the center distance between the master gear and the work gear, one can tell whether the work gear teeth are too thick, too thin, or within the correct tolerance.

The instrument used for this kind of measurement is one having two spindles so arranged that their center distance can vary under pressure. These spindles, carrying the master and work gear, are forced together with sufficient pressure to assure continuous contact on both sides of the teeth of the master and work gear. There is, preferably, a recording device attached to the movable spindle in such a manner as to record all changes in center distance as the teeth roll through mesh. Shaft gears and those preferably handled on arbors can be mounted between centers.

Measurement of Backlash

Another function of this type of instrument is to show a direct reading of the amount of backlash cut into the work gear or the amount the teeth are thin.

When planning ways of checking backlash in work gears by means of master gears, one quickly thinks of the simple method of firmly fixing two studs in a solid base at the proper center distance, employing a master gear of exactly correct size on one stud and placing the work gear in mesh with it on the other. The backlash is measured by a dial indicator or feeler gages. This is an extremely undesirable method and a pitfall into which many gear manufacturers have fallen.

The reason that this method is undesirable is that it necessitates the use of a master gear of unduly close limits on tooth thickness or overpin measurement. This type of

Master gears need not be superprecise if the inspection method is wisely chosen. In fact, a gear manufacturer is better off if he employs masters in a way that avoids exact overpin dimensions

master gear is not only expensive to purchase but, more important, hard to obtain in any reasonable length of time. After a delivery promise has been made on this type of master gear, it is undependable, because of the great risk of spoilage during its manufacture.

In outstanding contrast to this, the master gears required for variable center distance checking are much less expensive and can be obtained on a much shorter delivery basis. The reason for this is that they do not have to be held to an exact overpin dimension.

Another point to be considered here is that master gears wear rapidly, especially when used on hardened gears. The variable center distance type of master gear can, after becoming worn, be reground and made as good as new. The fixed center distance type of master gear, when slightly worn, is no longer safe and, of course, cannot be reground for this use.

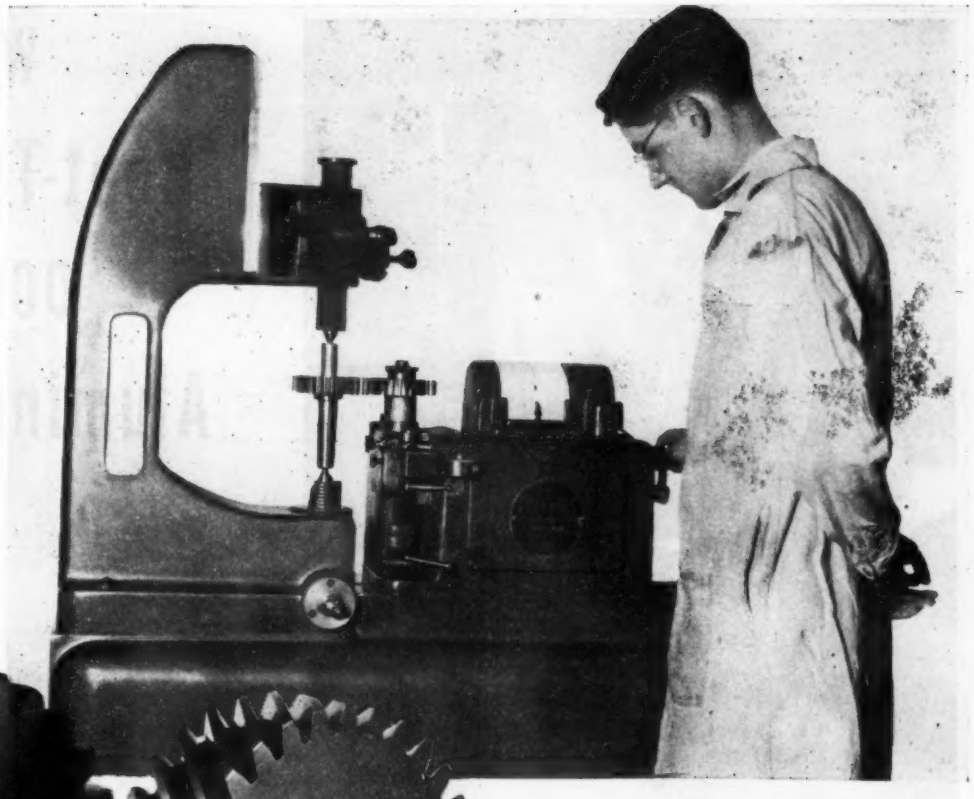
Most leading gear manufacturers have adopted, or are changing to, the variable center distance system. A prominent airplane engine manufacturer is making that change at the present time, even though it meant a great outlay of time and material to do so.

Reference has been made above to the permissible variation in overpin measurements of master gears. Let us also consider all other measurements of a master gear. Starting with the blank, the hole must be round and practically exact for size. The locating faces must be true with the hole. The teeth of the master gear, having been designed to contact the proper amount of the work gear tooth profile, must be checked for several things: The tooth spacing, or circular pitch, is important to assure the engaging and disengaging of the teeth at the proper time. The involute profile of the teeth is equally important, because it serves to check the involute on the work gear which, in turn, influences the uniformity of angular velocity of the driven gears in any drive. The concentricity of the teeth with the hole must be closely held. This is commonly referred to as pitch line runout. In case of helical master gears, the lead of the helix, or the advance of the tooth across the face of the gear, must be closely controlled.

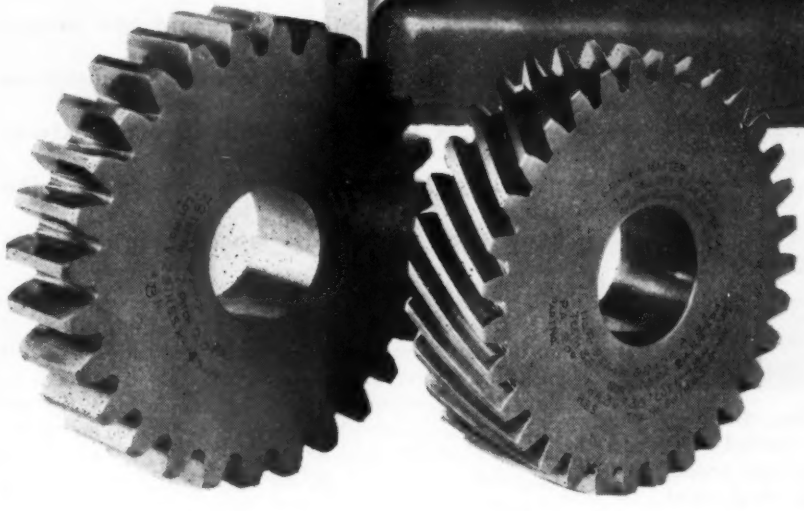
Master Gear Limits

Now, let us see what limits would be applied to a definite master gear. For example, take a master 3 in. in diameter, 1 in. face, 30 teeth, 10/12 pitch, 20-deg. pressure angle, 30-deg. helix angle. This master gear is to be used for checking the best grade of gears. The tolerance allowed on the tooth to tooth spacing, or circular pitch, would probably be 0.0002 in. between consecutive teeth and the same for total variation going around the master gear. On the involute profile, the tolerance allowed would be plus or minus 0.0001 in. The pitch line runout allowance would be 0.0003 to 0.0005 in. The lead of the helix would be given as so much tolerance indicator reading per inch of face. In this case, the limit would probably be plus or minus 0.0002 in. in the 1-in. face.

So far, the limits apply regardless of whether the master gear is to be used on a fixed or variable center distance system, but the tolerance on the overpin dimension of the master gear has not yet been covered. If the master gear is to be used on the fixed center distance system, this tolerance would probably be 0.0003, or maybe 0.0005 in., but if the master gear is to be used on the variable center distance system, the tolerance can be plus or minus 0.010 in. or even more. This is the difference that is all important. In the latter case, the outside diameter is sized to correspond to the oversize or undersize of the



Gears are inspected by mounting them in an instrument in mesh with an accurately made master. All changes in center distance are marked on a recording device as the gears are rolled together



Both spur and helical master gears can be employed with the movable spindle instrument. Masters can be made more easily if fixed center distances are avoided

pin measurement. This is to assure that the master gear will always contact to the proper depth in the work.

The above example shows about how the limits run on a master gear of that size. A 12-in. master gear would, by necessity, have a wider limit on such things as tooth-to-tooth spacing and pitch diameter runout.

Different applications of master gears require different limits. For example, sometimes work gears are checked by speeding them with a master gear on a fixed center distance with a brake load. Note in this case the pressure is put on the gears by a brake, rather than a radial pressure. Here again, it is important that the tooth spacing, involute and pitch line runout be held to close limits, but the tooth thickness is not important so long as there is some backlash in all positions, and yet the teeth are not thin enough to have excessive deflection. It is, however, necessary for the outside diameter to be held to a close limit, rather than to make it over or undersize to correspond to the over or undersize of the overpin dimension.

Wide Limit Gears

Sometimes wide limit gears are referred to as master gears, but this usually is misleading. For example, when shaving gears it is important that the overpin dimension of the work gear should not be more than a known figure when going to the shaving machine. Shaving stock in excess of this is likely to break the shaving tool. It would be impractical to check every work gear over pins. There is one simple way of doing it. That is to take a plate and mount in it two studs at the correct center distance, so that when two special gears are placed on these studs the work gear as prepared for shaving will just pass through between them. One of the studs should be made eccentric, so it can be set for any desired amount of shaving stock.

Because of the duties of these special gears and the fact that they are mounted on a variable center distance, they need not be closely held on any dimension. Special gears for various jobs of this nature should not be called master gears.

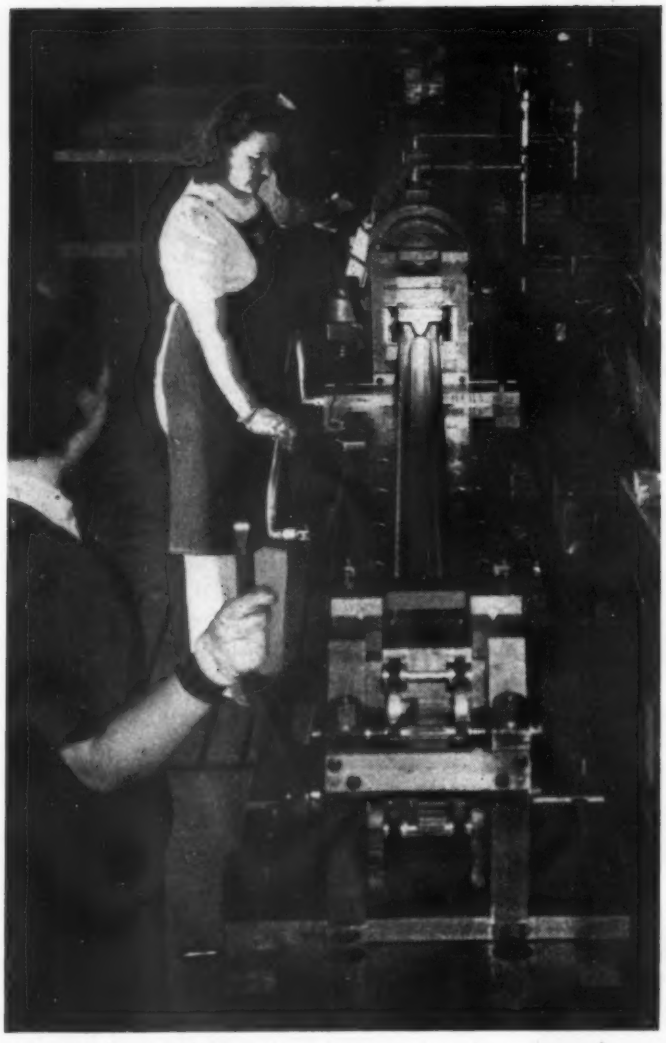
The face width of master gears is another troublesome point. Some users of master gears contend that they should be wide enough to extend beyond both sides of the work. That is, if the work is 1-in. in width of teeth, the master gear should be, say 1¼ in. That would not be too bad, but when that user has a work gear with 4-in. width of teeth, then the master gear would have to have a width of 4¼ in. Another user of master gears would work on the basis that in most cases the teeth would be the same shape, right or wrong, their whole length, and that even though the work might be 4 in. in width, a more practical master gear of 1-in. width would be just as good.

Undoubtedly, the second user is right, although there might be some special cases where the full face width master gear would be needed to hold exceptional tolerances.

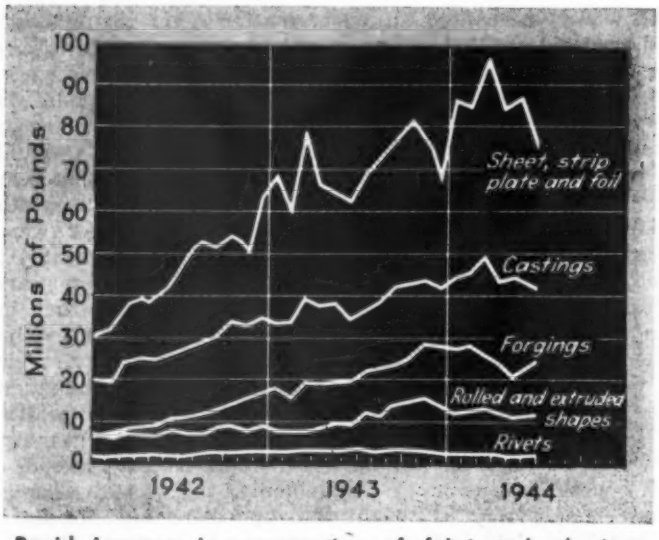
WHAT Heat-Treatment DOES TO Aluminum Alloys

BY M. E. TATMAN, Chief Metallurgist,
Consolidated Vultee Aircraft Corporation

Producers of civilian equipment are keenly studying the merits of fabricated aluminum for use in light-weight but strong postwar products. In this they will be aided by the knowledge of aircraft manufacturing plants



By stretching roll-formed sections so that they are given a permanent set of 3 1/3 to 4 percent, heat-treated material is straightened at low cost and higher physical properties are secured, especially the compression yield point

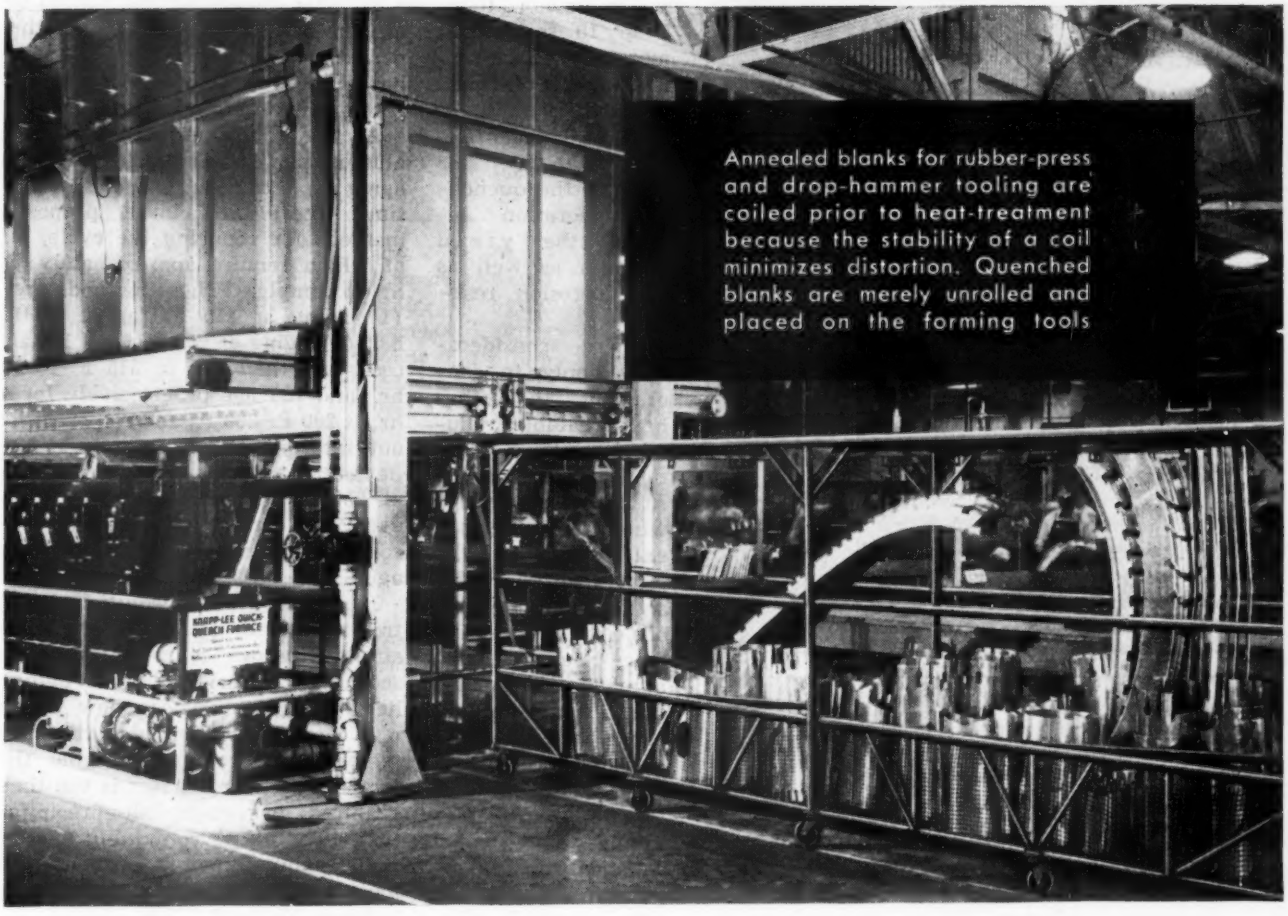


Rapid increase in consumption of fabricated aluminum products emphasizes the importance of heat-treatment of wrought sheet, strip and plate

WHILE CONSUMING immense quantities of aluminum alloys in the form of sheet, strip and plate, the aircraft industry has been forced to develop economical processes for developing required minimum physical properties. The problem is basically one of heat-treatment. And how heat-treatment is applied has much to do with distortion, and hence the amount of straightening or rework necessary before formed parts can be assembled into fabricated structures. The experience of the aircraft industry in this direction, especially in applying the newer high-strength aluminum alloys, should be of great value to plants without knowledge of the field but contemplating early use of these lightweight materials.

In discussing the heat-treatment of aluminum alloys, one might well begin with a material that is more or less representative: that is, 24S. The primary objective of hardening this material (by heating it to 920 F. for 10 to 60 min. and quenching in cold water) is to increase the physical properties. Minimum properties are not attained without distortion. So costly and time-consuming straightening was done with various tools. Finally, war requirements forced aircraft producers to seek means for eliminating the cause of distortion.

The distortion of aluminum-alloy parts is a function of the temperature differential between the heated piece and the quenching medium. Hence, attempts were made to reduce warpage by removing various detail parts from the salt bath to cool in air for many seconds before



Annealed blanks for rubber-press and drop-hammer tooling are coiled prior to heat-treatment because the stability of a coil minimizes distortion. Quenched blanks are merely unrolled and placed on the forming tools

quenching. This procedure diminished the distortion, but the mechanical properties and corrosion resistance were appreciably reduced. Also, distortion has been reduced by quenching with water fogs and sprays, but this treatment also results in a reduction of mechanical properties and corrosion resistance unless large quantities of water are used.

Recently there has been a trend toward quenching parts vertically, especially long narrow items. This practice reduces distortion and should be used whenever practicable.

In the case of sheet stock, roll-formed sections, extrusions, and other shapes of uniform cross-section, it is possible to remove distortion by stretching or rolling. Sheet stock is flattened, usually at the mill, by stretcher-leveling or rolling. Extrusions, in general, are straightened by stretching after heat-treatment.

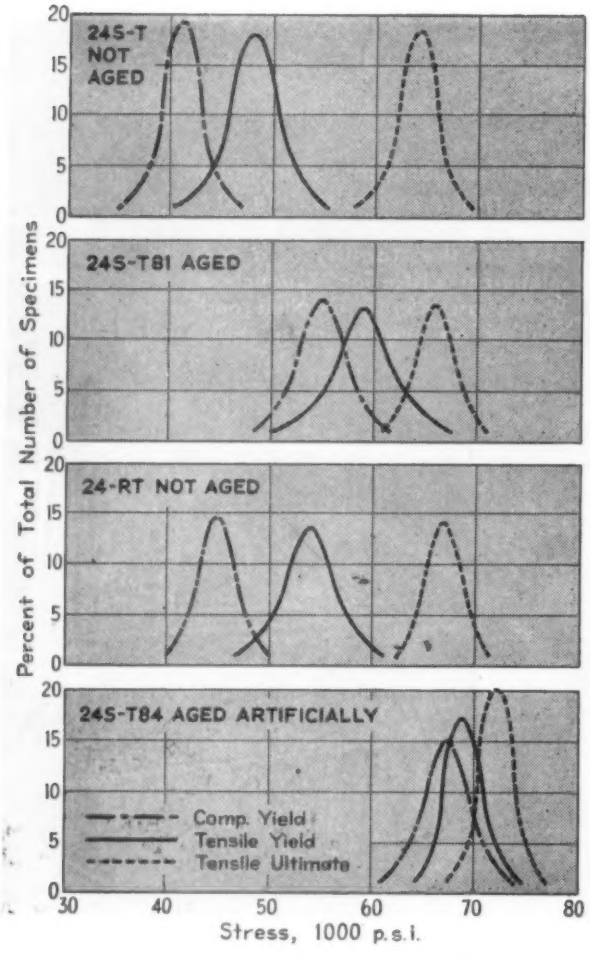
Some aircraft companies use roll-formed sections instead of extrusions for wing and fuselage stiffeners. In most cases the material is roll-formed in the annealed condition and is then heat-treated in 12- to 20-ft. lengths. Then, as a rule, the as-quenched sections are straightened by stretching only enough to eliminate distortion. In 1937, however, Roy A. Miller, chief structures engineer for Consolidated Vultee Aircraft Corporation, found that considerably higher design values could be used, particularly in compression, if the roll-formed sections were stretched 3½ to 4 percent permanent set at the time of straightening. The cost of stretching to 3½ percent set is negligible since the sections, of necessity, are stretched sufficiently to straighten them (½ percent).

A typical production set-up for stretching roll-formed sections is illustrated. The operator at the far end of the machine controls the amount of "stretch-under-load" such that the permanent set will be 3½ to 4 percent. Immediately following the stretching operation, the stretched sections are hardness tested to insure that no annealed material has been included.

To eliminate reworking parts that usually are formed in the annealed condition and subsequently solution heat-treated, many aircraft companies have recently changed to the forming of "as-quenched" material wherever possible. Rubber-press and drop-hammer blanks in thicknesses below 0.072 in. ordinarily cannot be heat-treated in the flat condition without excessive distortion. Within the past few years several companies have found that it is possible to roll rubber-press blanks of almost any shape into coils 6 to 8 in. in diameter and then solution heat-treat and quench the annealed coils. Because of the stability of the tubular coils, little or no distortion arises in the heat-treat operation. The rolled blanks, after the quenching operation, are simply unrolled and formed.

Consistent results from solution heat-treatment are obtained by close control of the following variables: (1) solution temperature, (2) time at temperature, (3) time involved in executing quenching operation, and (4) cooling velocity. These variables are important with respect to the mechanical properties of clad 24S material.

If the solution heat-treat temperature is too low in the case of clad 24S material, the copper-aluminum compound is not completely dissolved and the mechanical properties may be low despite proper control of the other variables. On the other hand, if the



Probability curves for clad 24S material illustrate the physical properties that may be expected in lots of material given various heat-treatments

temperature is too high, the eutectic temperature may be exceeded and there is likely to be eutectic melting which adversely affects the mechanical properties and corrosion resistance of the material.

Insufficient soaking of clad 24S material at the proper temperature will result as a rule in the incomplete solution of $CuAl_2$ and the mechanical properties will be low. Satisfactory soaking periods are 10 min. for thin material, 20 min. for thick material, but 10 min. additional is often added to either period as a factor of safety. Soaking times in excess of the minimum do not affect the mechanical properties of clad 24S. Nevertheless, to minimize copper diffusion into the cladding, the soaking time should be close to the minimum specified.

Mechanical properties in excess of minimum specification values can be attained, provided the time of transfer from the furnace to the quenching medium is kept short. Thin material should not be allowed to cool in air more than 7 to 10 sec., thick material will be satisfactory if exposed as much as 15 to 20 sec. Too long an exposure to the air prior to the quenching operation reduces the yield strength as well as the corrosion resistance.

These considerations apply, in general, to the other heat-treatable aluminum alloys, particularly the high-strength alloys which are being used extensively in the latest aircraft designs. The aluminum alloys containing zinc, however, have a much wider solution heat-treating range than the presently used 24S alloy. For example, R303 and 75S, may be solution heat-treated satisfactorily at temperatures between 825 and 930 F. Because of their non-homogeneous characteristics, extruded forms of these alloys should not be solution heat-treated above 900 F. to avoid trouble.

The new alloys harden with increase in time after quenching similarly to the 24S alloy. However, the rate of hardening of the newer materials is somewhat slower than for 24S. This, of course, permits a longer time in which "as-quenched" material may be satisfactorily formed. In general, these alloys have good formability for at least 2 hr. after quenching and should be formed or straightened within this period whenever practicable. Age hardening of these alloys may be retarded by refrigerating at 10 F.

A major disadvantage of the aluminum-zinc alloys is the long aging cycle of 24 hr. At the present time, there are three proposed methods for reducing the cycle, all of which require approximately 12 hr. to complete. These methods are: (1) aging at 250 F. for 11 to 12 hr.; (2) aging at 212 F. for 4 hr. air cool, and then age at 315 F. for 8 hr.; and (3) age progressively for 4 hr. at 200 F., 250 F., and 300 F. without intermediate cooling. It is believed that a straight 11-hr. aging at 250 F. is most practical. However, the corrosion and stress-corrosion tendencies of material so aged are still being investigated.

In addition to a solution heat-treatment, all of the new high-strength alloys must be given a secondary (precipitation or aging) heat-treatment. These new alloys may be aged at a number of time-temperature cycles; the higher the temperature, the shorter is the time required to accomplish precipitation. The alloys containing zinc as their main alloying element age most satisfactorily at temperatures between 350 and 375 F.

The hardening procedure used on the various tempers of clad 24S is as follows:

1. Solution heat-treat at 920 F. ± 10 F. for 20 to 45 min., depending upon the thickness,
2. Quench into water which should be 100 F. or lower,
3. Straighten or cold-work as required,
4. Age at 375 F. ± 5 F. for 6½ hr. ± ¼ hr. if required.

As pointed out, there should be little or no delay between the solution treatment and the quenching operation. It is important to note that as far as the final mechanical

TABLE I—COLD-WORKING REQUIRED TO DEVELOP MINIMUM PHYSICAL PROPERTIES IN 24S ALUMINUM

Percent Set	Solution H.T. Temper	Solution and Precipitation H.T.-Temper
0 (Heat-treated in fabricator's plant)	24S-T	24S-T80
1 (As-received sheet)	24S-T	24S-T81
4 (1)*	24-RT(1)	24S-T84
6 (As-received sheet)	24S-RT	24S-T86

*(1) Consolidated Vultee designation for roll-formed sections which have been stretched 4 percent.

TABLE II—MECHANICAL PROPERTIES OF HEAT-TREATED CLAD ALUMINUM ALLOYS[1]

MATERIAL		MECHANICAL PROPERTIES							
			Tensile						
Solution Heat-Treated Tempers			Ultimate psi.	Yield psi.	Compressive Yield psi.	Elongation % in 2"	Shear Ultimate psi.	Bearing[2] Ultimate psi.	Bearing[3] Ultimate psi.
1. 24S-T		Typical	66,000	41,000	41,000	19	38,000	92,000	115,000
(H.T. by user)		Minimum	60,000	38,000	38,000	11	36,000	90,000	114,000
2. 24S-T		Typical	66,000	48,000	43,000	18	39,000	98,000	125,000
(As-received)		Minimum	64,000	42,000	42,000	11	38,000	96,000	122,000
3. 24-RT		Typical	67,000	54,000	45,000	14	42,000	105,000	130,000
(Stretched 4%)		Minimum	65,000	52,000	44,000	10	41,000	102,000	129,000
4. 24S-T		Typical	70,000	57,000	53,000	11	42,000	105,000	130,000
(As-received)		Minimum	68,000	53,000	53,000	8	41,000	102,000	129,000
5. 75S-W		Typical	70,000	42,000	42,000	16	39,000	95,000	120,000
(H.T. by user)		Minimum	.....	.....	.....	..	.....	.....	.....
6. R303-W		Typical	68,000	41,000	41,000	17	38,000	92,000	115,000
(H.T. by user)		Minimum	.....	.....	.....	..	.....	.....	.....
Solution and Precipitation Heat-Treated									
1A.[4] 24S-T80		Typical	66,000	52,000	52,000	9	42,000	95,000	120,000
		Minimum	62,000	49,000	49,000	8	41,000	93,000	118,000
2A. 24S-T81		Typical	69,000	62,000	62,000	6	43,000	102,000	129,000
		Minimum	67,000	59,000	59,000	5	41,000	100,000	127,000
3A. 24S-T84		Typical	72,000	68,000	68,000	6	44,000	107,000	135,000
		Minimum	70,000	66,000	66,000	5	43,000	105,000	133,000
4A. 24S-T86		Typical	74,000	70,000	70,000	5	44,000	107,000	136,000
		Minimum	72,000	69,000	69,000	4	43,000	106,000	135,000
5A. 75S-T		Typical	77,000	69,000	69,000	11	49,000	114,000	144,000
		Minimum	72,000	62,000	62,000	8	45,000	112,000	142,000
6A. R303-T275		Typical	75,000	68,000	68,000	9	48,000	113,000	144,000
		Minimum	70,000	64,000	64,000	7	.....	.....	.....

(1) Material 0.064 in. thick and over.
(2) Bearing ultimate at edge distance of 1.5 times diameter of bolt or rivet.
(3) Bearing ultimate at edge distance of 2.0 times diameter of bolt or rivet.
(4) The precipitation-hardened tempers of the corresponding numbers cited above.

properties are concerned, the time delay between the quench and the cold-working operation is unimportant.

The precipitation heat-treat may follow at any time after the quenching or cold-working operations. The various tempers of 24S aluminum alloy and the amounts of cold-work in terms of equivalent percentage of permanent tensile set, which are considered necessary to develop the guaranteed minimum mechanical properties after proper processing, are shown in Table I.

Probability curves illustrate what physical properties may be expected for both solution heat-treated, and solution and precipitation heat-treated material. These data are lower than expected for comparable material being used in most manufacturing plants for the following reasons: (1) the cladding thickness on each surface was 5 percent of the total thickness, as contrasted with the 2½ percent cladding on material over 0.063 in. in thickness currently procured to Specification AN-A-13; (2) the aging cycle used, 355 F. for 9½ hr., was inadequate insofar as it does not produce complete aging nor maximum mechanical properties. It should also be noted that the artificial aging (second and fourth sets of curves) increased all the strength properties.

Aluminum alloys 75S, made by Aluminum Company of America, and R303, manufactured by Reynolds Metal Company, contain 5 to 7 percent zinc as their major alloying element, with small amounts of copper, magnesium and manganese. The hardening treatments recommended by the manufacturers of these two alloys differ slightly. Extensive tests have proved, however, that these two alloys may be heat-treated by the same procedure. For extruded material the processing should be as follows: (1) solution heat-treat at 870 F. ± 10 F. for 20 to 60 min., depending upon the thickness; (2) quench in water at 100 F. or less; (3) straighten or cold-work as required; and (4) age at 250 F. for 24 hr. In the case of sheet material, the hardening procedure is the same as that given for extrusions, except that a broader solution heat-treat range, 860 to 930 F., is permissible.

The two alloys, 75S and R303, differ greatly from the 24S alloy in one respect: namely, cold-work applied to the aluminum-zinc alloys between the solution and precipitation heat-treatments has little or no effect upon the mechanical properties of the aged temper. In general, the procedures as well as the problems associated with the fabrication of both 75S and R303 aluminum alloys are similar to procedures and problems resulting from the use of the aged tempers of 24S aluminum.

Compound Sine Plate Simplifies Difficult Positioning Problems

BY E. J. CHARTIER

Typical set-ups by machinists often involve setting work at odd angles to working surfaces of machines. An illustration of this difficulty is solved by use of the compound sine plate

MACHINING compound planes and boring at angles to compound planes become more frequently necessary as the complexity of equipment required to manufacture intricate mechanisms increases. The most efficient means of positioning material to be worked by standard machines to compound planes involves the use of the compound sine plate. Although the compound sine plate is a well known device, it sometimes presents a problem where unusual combination of conditions arise. As an example, a conventional drawing of a fixture block is used.

The problem is to produce the block and provide the locating hole for the gaging fixture. The hole must be located and bored in the block within tolerances that are within the nominal operating tolerance of the machine. Under these conditions, the required planes and the hole must be machined at the same setting because there is no allowance for the error involved in resetting the block.

To place the block in position for machining, the plane *EJKL* indicated in Fig. 2, must be parallel with the machine base and the vertical axes of construction holes *M* and *N* must be parallel to and normal to, respectively, the longitudinal traverse of the machine.

To bring the plane indicated by points *EJKL* to parallel with a machine base, the block must be rotated clockwise, through the angle r about the construction hole *N*, thus bringing the axis of the construction hole *M* to horizontal. The block must then be rotated about the construction hole *M* through the angle w.

To accomplish this with the compound sine plate, it is first necessary to bore construction holes in the block shown in Fig. 1.

Construction hole *N* is bored to have an axis normal to the plane established by points *EJBA*. Construction hole *M* is bored parallel to the base *KLCD* and at angle r to the base *ABCD* with the axis intersecting the axis of construction hole *N*. This is done by setting the top stage of the sine plate at angle r to the base and mounting the block with plane *EFDA* down and with line *EF* closest the hinge.

After drilling, the block is placed on the stage of the compound sine plate with the plane formed by points *ABCD* down, the axis of construction hole *N* parallel to the

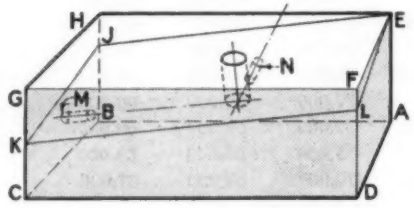


Fig. 1—Fixture block is machined from a rectangular steel block. Profile of the finished piece desired is indicated on the block without relation to the position required for machining

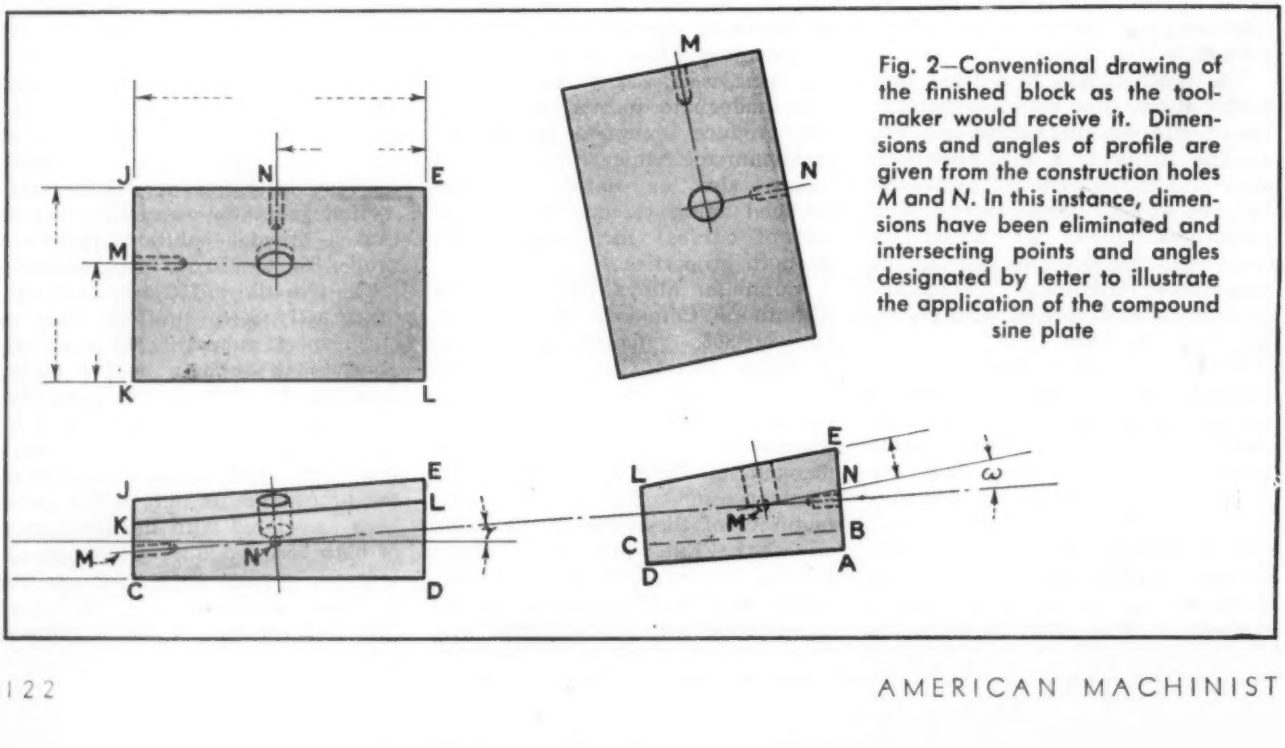


Fig. 2—Conventional drawing of the finished block as the toolmaker would receive it. Dimensions and angles of profile are given from the construction holes *M* and *N*. In this instance, dimensions have been eliminated and intersecting points and angles designated by letter to illustrate the application of the compound sine plate

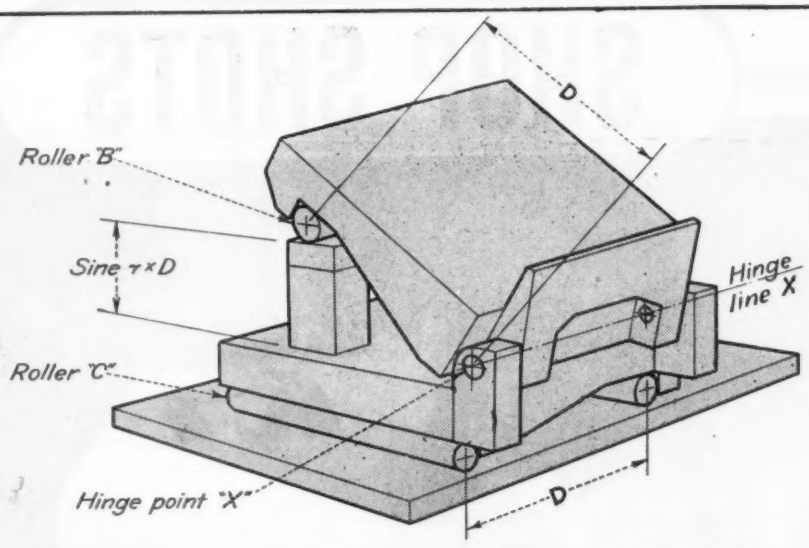


Fig. 3—Upper stage of the compound sine plate is elevated at angle r by placing gage blocks under the roller. Proper height of gage blocks is calculated by multiplying the dimension D, which is constant, by the sine of angle r. Lower stage is set to angle w by the same procedure, with the exception that the sine of angle w is substituted for the sine of angle r when making the calculation

hinge and with construction hole *M* opposite the hinge.

As construction hole *N* is normal to the plane *EJBA*, this surface is indicated square with the machine before adjusting the sine plate.

The upper plate is rotated about the hinge line *X* as shown in Fig. 3, by setting gage blocks under the roller *B* to form the angle *r* with the lower stage. Gage blocks are set under one of the rolls of the lower stage to set the hinge line at the angle *w* to the base. As the block is set on the upper stage of the compound sine plate, the plane of *EJKL* and the axis of construction holes *M* and *N* are parallel to the base.

Locating pins inserted in the construction holes as illustrated in Fig. 4, serve as bases for the location of the hole specified in the block. The block may be machined and bored in the compound sine plate setting.

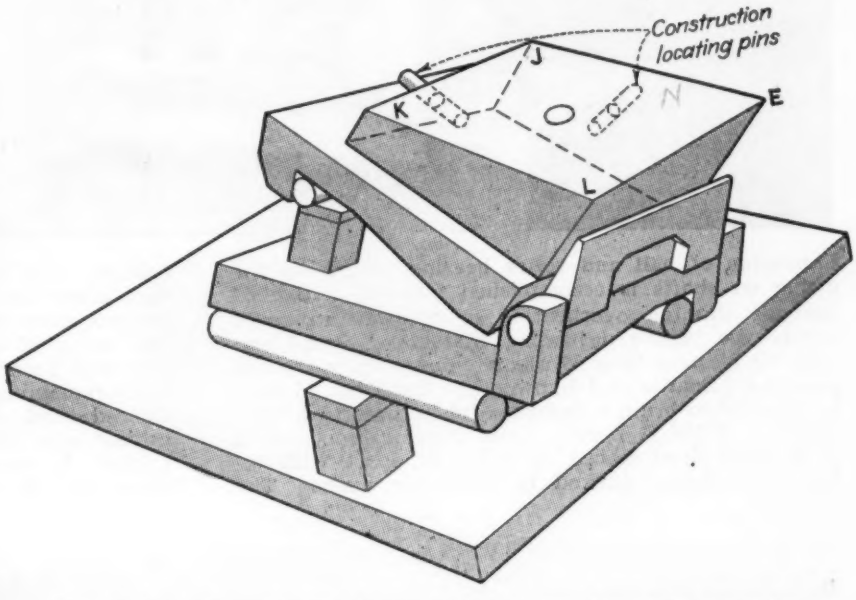


Fig. 4—Axes of construction locating pins are used as datum lines for aligning the block on the machine. In this position, the block can be machined with the longitudinal, transverse and vertical movements of standard machine tools.

Test Laboratories 'Torture' Products

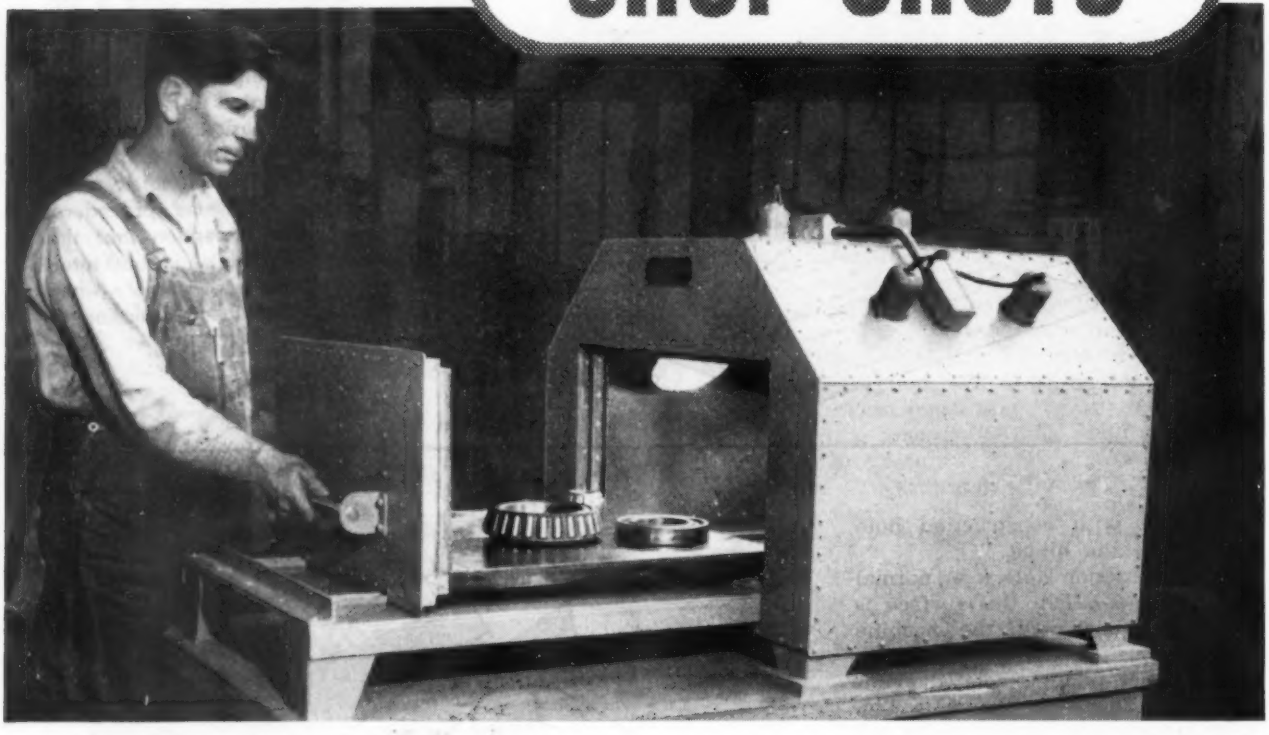
THE IMPORTANCE of adequate and rigid tests to determine the serviceability of products cannot be underestimated. The General Electric Company's laboratories demonstrate the scientific approach and progress made in testing newly designed products and materials.

Before seeing the light of a retailer's shelf, a new product is likely subjected to twisting, stretching, shattering, intense heat and freezing atmosphere. Temperatures are made more extreme, speeds increased, and loads made many times heavier than in actual operation. Some tests last months or years, and others are speeded up to crowd a month's torture into an hour.

For example, turbo-superchargers receive the punishment of the stratosphere in scientifically built altitude test chambers. Hot gases reaching 2,000 F. can be introduced into the turbines at 450 lb. per min., or, in another test chamber, refrigerated air as cold as —100 F. can be supplied in quantities of 1,200 lb. per min. In fact, tests on individual parts of a turbo-supercharger are so violent they duplicate in a few minutes the same effects encountered by the unit during its life on an airplane.

An example of one test running over years is represented in a turbine bucket that has been kept vibrating for 15 years. It is estimated the bucket has vibrated more than 100 billion times. Only when it falls to pieces will the test be considered complete.

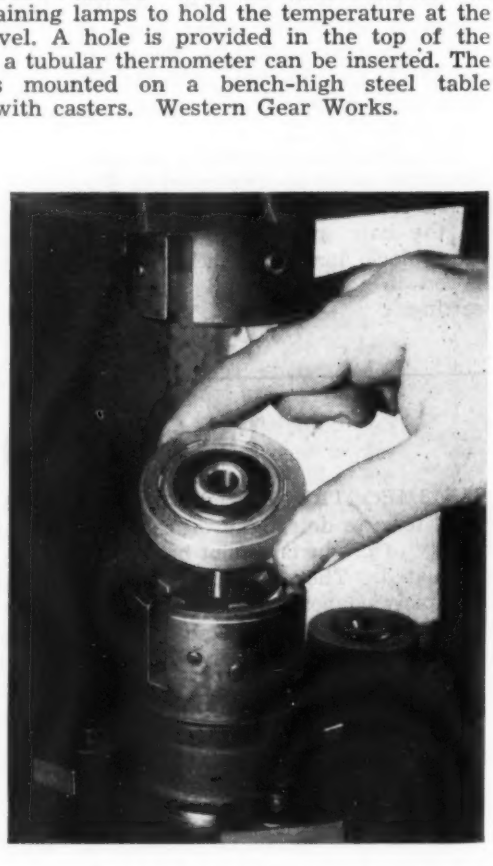
SHOP SHOTS

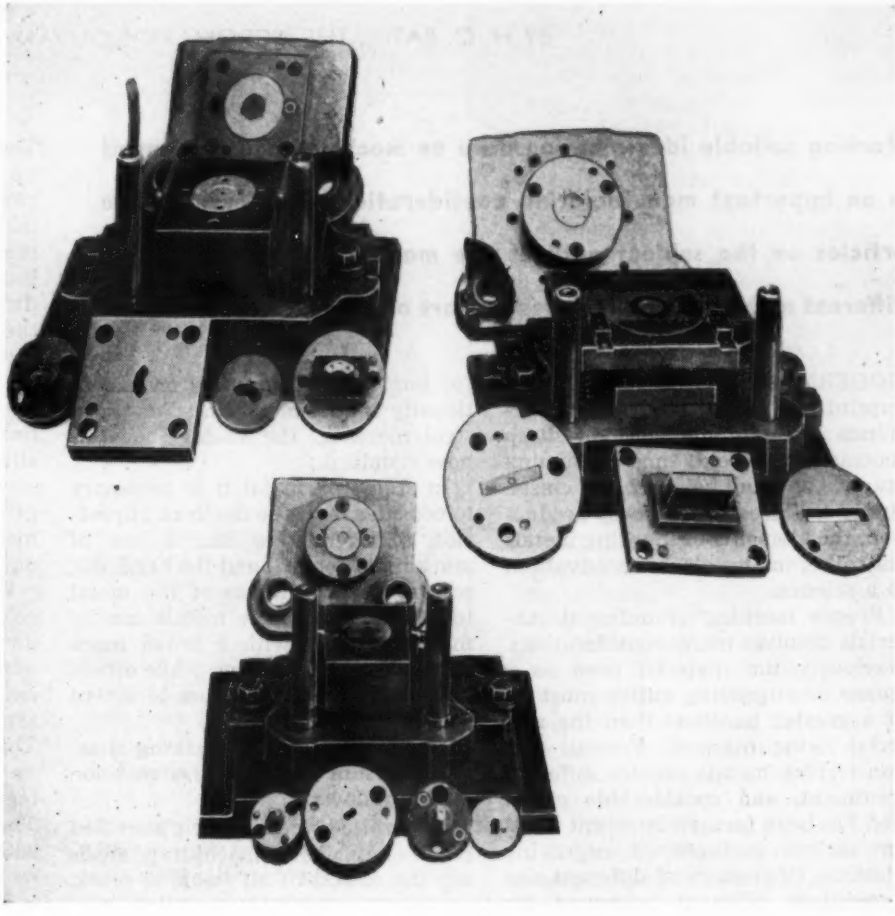


Expansion of ball and roller bearing assemblies for fitting on shafts is accomplished without danger of spoilage through overheating or warping in small bench-type infra-red heating cabinets designed and built by Western Gear Works engineers for use in the company's Seattle and Lynwood plants. Only 15 min. is required to bring a bearing of 5-in. bore to a temperature of 470 F. Double walls of the cabinet are of ⅛-in. steel sheet spaced about 1½ in. apart, with asbestos insulation packed between the walls. The cabinet is 60 in. long with drawer extended. Inside the cabinet are six 375-watt Birdseye heat lamps set in three rows of two each. Two switches are provided, one turns off three of the lamps when the desired heat has been reached while the other controls the three remaining lamps to hold the temperature at the desired level. A hole is provided in the top of the cabinet so a tubular thermometer can be inserted. The cabinet is mounted on a bench-high steel table equipped with casters. Western Gear Works.

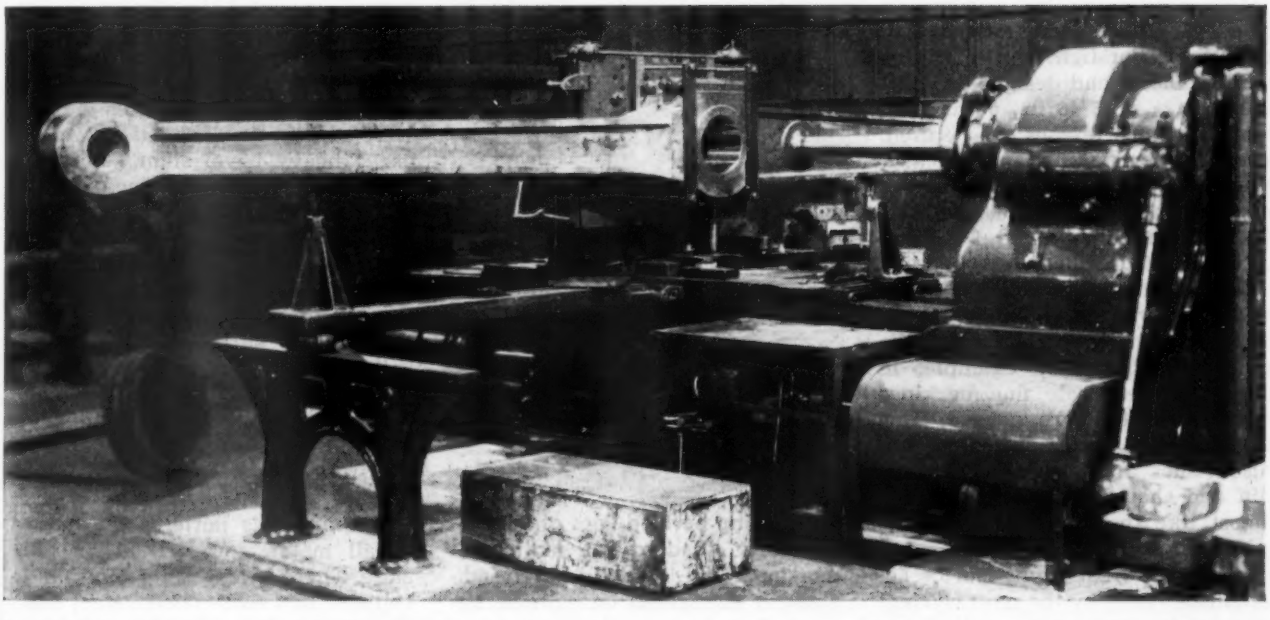
To facilitate replacement in service, bearings are staked, instead of spun, into aircraft parts, except for assemblies in magnesium alloy housings. Staking is performed by placing the part containing the bearing between upper and lower dies in a punch press. The dies, with projecting staking bits, force the housing material over the edge of the bearing in six places around its perimeter, thereby anchoring the bearing firmly within its housing. Both sides of the housing are staked simultaneously in a single stroke of the press. In the swaging method formerly used, it was necessary to hold the part in a block on a drill press and spin the metal over the bearing around its perimeter. There was no assurance with the spinning method that a damaged or worn bearing, after removal from the housing, could be satisfactorily replaced. The spun-over metal, serving as a retainer ring, frequently sheared off, preventing a second swaging operation. When this occurred, the part was necessarily scrapped. Service men now can replace the bearing by merely staking the material in a different area around the perimeter. The original and two replacement stakings are possible, since the total length of the six-stake indentations requires but a third of the distance around the bearing perimeter.

In magnesium alloys, because of low ductility, the pressure necessary to form a stake impression often fractures the housing around the perimeter of the bearing. An aluminum alloy bushing is, therefore, inserted between the bearing and housing and its edge spun simultaneously over the chamfer on bearing and countersink in housing. It is estimated that staking consumes only a third the time required for spinning. Glenn L. Martin Company.





These dies were originally designed to produce high quality, low quantity round washers. The shop has seven of these dies, in three sizes—¾, 1½ and 2½ in. These sizes are the largest diameters of the dies. Units for the dies consist of a piercing punch, stripper, knockout and blanking die and can be installed in a half-hour. After seeing the high quality of work they produced, it was decided to build units for irregular shaped parts and use them in the die-sets. The supplier specialized in round washer dies and did not care to build other shaped dies, so we made them in our own tool department. The cost of making the new units is about 60 percent of that for standard compound dies. Each unit is kept in a 6x6-in. sheet-metal box. Fifty-five irregular shaped dies and 70 washer dies are used in the seven die-sets. Shorter time is required for making the dies and a minimum of storage space is required. C. G. Mathias, Mansfield Plant, Westinghouse Electric Corporation.



A precision internal grinder was equipped to finish the bushing of a tandem main rod for a locomotive. An extension is fastened to the spindle and a grinding wheel, which to avoid interference should not be larger than 75 percent of the hole diameter, is attached to the end. Because of the length of the rod, an outboard jack supports the part projecting beyond the table and reciprocates with the table. The outboard jack carrier rolls on a support mounted on a foundation. Daniel D. Wells.

Pointers on Marking Metals and Plastics

BY H. O. BATES, THE ACROMARK COMPANY

Marking suitable identification data on machines and equipment is an important manufacturing consideration. This first of two articles on the subject outlines the marking characteristics of different materials and includes a chart on pressure requirements

MODERN MARKING devices for imprinting identifications on machines and equipment are in sharp contrast to the old, time-consuming practice of using hammer and chisel. Under the pressure of mass production, the elements of marking metals and other materials have advanced to a science.

Proper marking of different materials involves many considerations. Obviously the material used as a stamp or engraving cutter must be of a greater hardness than the material being marked. Ferrous and non-ferrous metals require different treatment, and considerable attention has been focused in recent years on various methods of engraving plastics. Characters of different size necessitate different pressures for uniformity.

Steel die-sinking has become an industry within comparatively recent years. For light work, such as small emblems and designs or characters of ⅛ or 3/16 in., a range of standard punch presses can be used. When heavier sinking is required, it is necessary to use hydraulic presses capable of applying 50, 100, 150, 300, 500 and sometimes up to 1,000 and 2,000 tons of pressure.

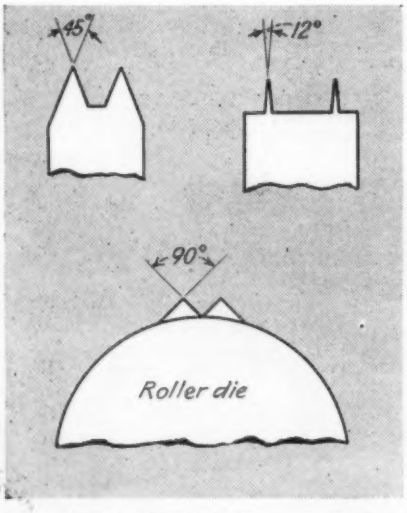
Consideration must be given to the type of mark desired before proceeding with preparation of the stamps or dies. For example, in marking a steel scale, fine markings to indicate 64ths are needed. This can only be accomplished if the raised lines are properly engraved thin and sharp with a slight bevel, almost like the blade of a pocketknife.

Engraving of this type can be accomplished only by the most efficient of precision machines, skilled operators and hand engravers. This example, however, represents one extreme. The other extreme is the 90-deg. bevel sometimes necessary for imprinting characters on exceptionally hard material. For most steel marking, the 45-deg. bevel is now standard.

In stamping metal it is necessary to consider first: the depth of impression required; how fine a line of marking is needed; and the hardness, brittleness or softness of the metal to be marked. Some metals can be marked deeply with a broad mark and a single heavy blow while others will crack, break or refuse to accept the heavy blow.

Information on the marking characteristics of some of the common metals follows:

Cold-rolled steels in their annealed state along with machinery steels are the easiest of all steels to mark.



Dies having beveled lines of 45 deg. are now standard for most steel marking. The 12-deg. bevel indicated is considered an extreme because lines must be thin and sharp. The 90-deg. bevel represents another extreme that is sometimes necessary for marking characters on exceptionally hard material

The steel displaces easily, throwing up at each side of the mark and affecting only that steel in the immediate marking area. If, however, the steel is only slightly thicker than the depth of the mark, considerable distortion will occur at and around the mark. In marking cold-rolled steel, a 45-deg. bevel is desirable since it broadens the mark as the depth is increased. If only a thin, fine line mark is needed, it is advisable to use a lighter bevel. If a level surface is desired, it is necessary to grind or machine the surface after marking because of edges thrown up during the marking process.

Tool steels react much the same as cold-rolled steels to marking. They do require a heavier blow, however, with the exception of chrome steels and some other special alloys which are tough in their annealed state. This is particularly true of stainless or nickel steel, and to mark it at least a 45-deg. bevel should be used. The blow should not be sudden but rather a gradual pressure as applied by a power press.

Cast iron is brittle and easily chipped in marking. It is advisable to used a stamp with a heavy 45-deg. or greater bevel. The sides of the bevel tend to press downward, creating less throw-up and a maximum mark. Since castings often have a scale of flint hardness, it is well to use a heavy bevel stamp to insure the strength and sturdiness of the character.

Cast bronze and brass react much the same as cast iron but lean somewhat to the same results as when stamping cold-rolled steel, particularly if the surface has been machined. Less pressure is required because this material is softer than cold-rolled steel.

Copper reacts much the same as cold-rolled steel but requires much less pressure for stamping.

Aluminum is perhaps the easiest of all metals to mark in its pure state. There is less distortion than in copper or cold-rolled steel and slightly less throw-up. A heavy bevel of 45 deg. has been found satisfactory for stamping this material. The abrasive quality of aluminum is frequently overlooked in marking. Un-

CHART FOR DETERMINING TONS PRESSURE REQUIRED FOR STAMPING VARIOUS SIZES OF CHARACTERS INTO ANNEALED ALLOY TOOL STEEL

Character Size	Tons Pressure Required to Sink One Character	Tons Pressure 5 Characters	Tons Pressure 10	Tons Pressure 50	Tons Pressure 100
1/16"	1	2½	17	35	50
1/8"	2½	5	20	45	75
3/16"	4	8	22	55	90
1/4"	6	10	25	65	100
5/16"	7	17	40	85	120
3/8"	8½	20	50	100	135
7/16"	9½	25	60	115	145
1/2"	10	30	65	120	150
9/16"	12	40	85	150	170
5/8	14	50	100	165	180
11/16"	15½	70	135	180	200
3/4"	16½	75	150	185	220
13/16"	17¼	95	165	210	250
7/8"	18	110	180	225	275
15/16"	19	135	190	240	290
1"	20	150	200	250	300

A. To stamp cold-rolled annealed subtract 20 percent
B. To stamp stainless steel annealed add 100 percent
C. To stamp soft brass subtract 50 percent

less a heavy bevel and hardness is in the stamp, it will wear quickly and become dull, breaking after a short period of use. For this reason, a chrome alloy stamp of exceptional hardness, Rockwell C scale 61 or harder, is advisable.

Flat-faced stamps and dies are confined generally to marking broad-faced characters that are to be filled, such as number plates. A flattening operation is necessary after each marking to remove distortion from the plate and to flatten the surface for successful filling.

A variety of types of engraving is used in marking plastics because not all plastics are of the same hardness or consistency. Plastics may be classed as follows:

1. Soft resilient, such as Vinylite and new resilient forms of Lumarith.
2. Soft non-resilient plastics, such as celluloid which reacts to cold-marking much the same as fiber.
3. Hot molded plastic, such as Lucite, Bakelite and several similar formulas.
4. Powder molded plastics used for electric plugs, instrument panels and similar items.

All plastics, except those similar to celluloid which includes Tenite and certain forms of Vinyl acetate, are best marked with heated marking dies. The dies must be properly engraved and heated to proper temperatures. Vinylite, for example, requires a heated die of around 365 F. to accept a mark and some plastics require more heat. Celluloid is marked easily with dies heated to less than 200 F.

Molded powder plastics are brittle and must be marked with greater care, greater heat and less pressure than semi-hard plastics. It is advisable to use fine, thin lines for the engraved characters, and the dies or stamps must always be engraved with a flat face. Other plastics, such as celluloid, will react well to fine or broad lines, but the characters must be flat on the face.

In marking molded powder plastics, the width of the flat face of characters should range from 0.008 to perhaps 0.015 in., depending upon the brittleness of the plastic and the solidness of the body of the piece being marked. Other plastic groups can be marked with virtually any width of face. To obtain a discernible mark, however, it is necessary to apply color, and that is where the heat applied to make the die mark also serves another purpose—that of applying color.

The fact that hot dies are generally used in marking machines makes possible the application of color. Plastic marking machines are, therefore, assembled with transfer tape mechanisms which carry the tape across the face of the die, resulting in color being transferred to the plastic part when pressure of the hot die against the part is made. Usually a color or transfer is selected in sharp contrast to the color of the plastic. The transfer tape is usually of a pigment or metallic formula that attaches itself at the points where the die forces it against the plastic.

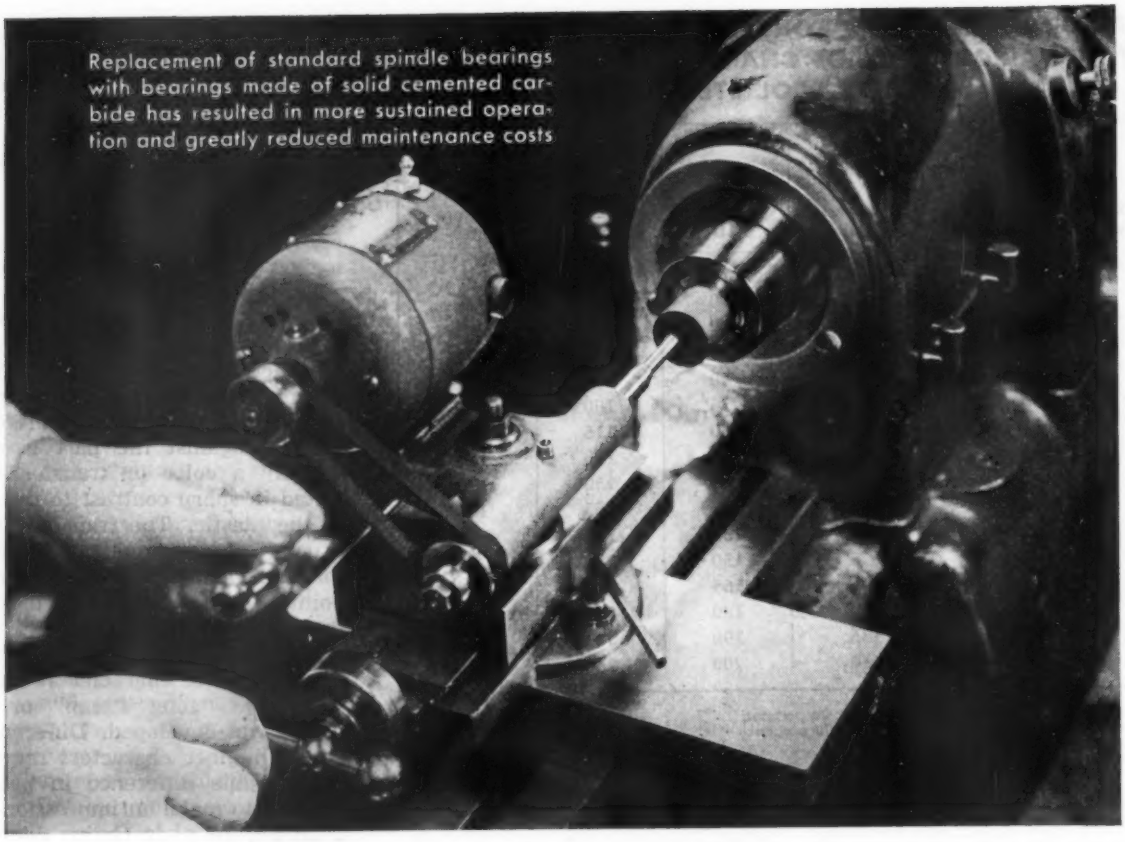
To facilitate marking more than one number or character at a single blow, the "gang stamp" or type holder was developed. Different letter or number characters require a considerable difference in pressure or blow to make an impression. For example, the plain Gothic figure "1" requires less than one-fifth the amount of blow that the letter "M" requires. Consequently, a variable combination, such as "M-0.015" must be given sufficient pressure to sink the "M".

In press holders, the only limitation of multiple lines and area is the amount of power the press can apply. The accompanying chart presents a formula that is not claimed to be accurate but is of sufficient approximation to aid the shop man in selecting a press or the amount of stamping to be done in a definite press.

An article in a forthcoming issue will discuss further the subject of marking, including descriptions of automatic and non-automatic marking equipment.

All About Flame Cutting

We have been fortunate in getting one of the outstanding authorities on the subject to prepare for us a series of articles on the oxyacetylene cutting of metals. This process has widened its field of application by leaps and bounds. It is cheap, clean and effective. The articles on it will get down to basic principles—the materials which can be cut, the equipment available for the purpose, the recommended gas pressures and cutting speeds, and other details of technique that will lead to good practical results. The author is Dr. G. V. Slottman, Applied Engineering Department, Air Reduction Company. Look for the first installment in an early number.

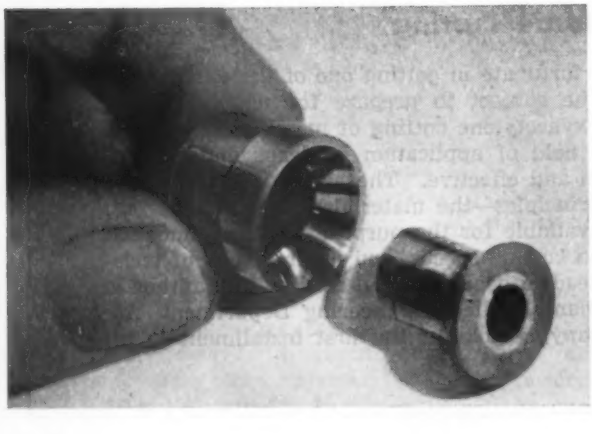


Replacement of standard spindle bearings with bearings made of solid cemented carbide has resulted in more sustained operation and greatly reduced maintenance costs

Cemented-Carbide Bearings Facilitate Continuous High-Speed Grinding

BY JAMES R. LONGWELL, CARBOLOY COMPANY

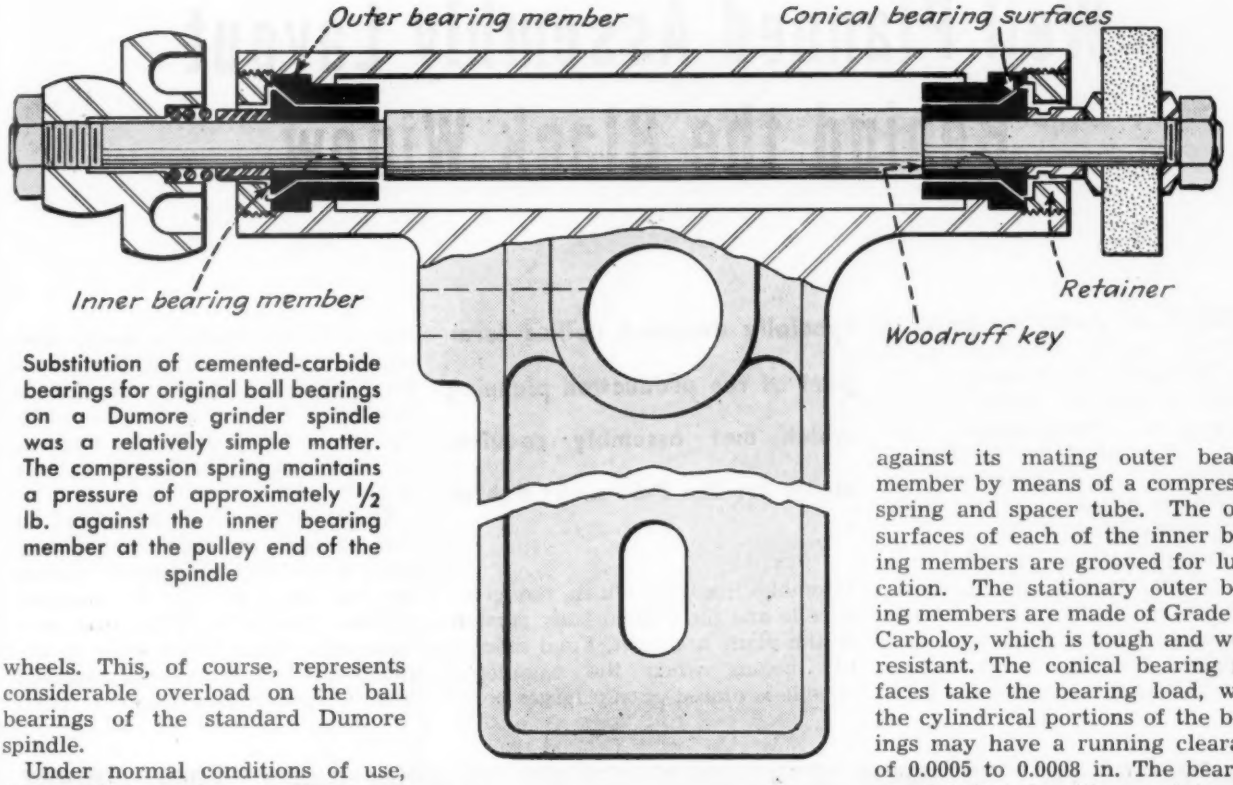
Where conditions of overload, excessive wear and shaft play exist, cemented carbides offer a solution and reduce overhead



Conical bearing surfaces of the inner and outer carbide bearing members are diamond lapped to a finish of 1 to 2 microinches. The inner bearing member is grooved to insure adequate lubrication

WHERE METAL PARTS and tools show excessive and rapid wear, cemented carbides have been applied to distinct advantage. Workrests for centerless grinders, gaging members and other parts have been improved through the use of these wear-resistant materials. A new application, which extends the usefulness of cemented carbides, is in sleeve bearings for precision high-speed spindles.

Standard Dumore toolpost grinders are being used in the Carboloy plant for the production grinding of internal and external surfaces of cemented-carbide die nibs. These grinding operations are performed with diamond wheels, and the resultant pressure is about ten times that normally used with abrasive



Substitution of cemented-carbide bearings for original ball bearings on a Dumore grinder spindle was a relatively simple matter. The compression spring maintains a pressure of approximately 1/2 lb. against the inner bearing member at the pulley end of the spindle

wheels. This, of course, represents considerable overload on the ball bearings of the standard Dumore spindle.

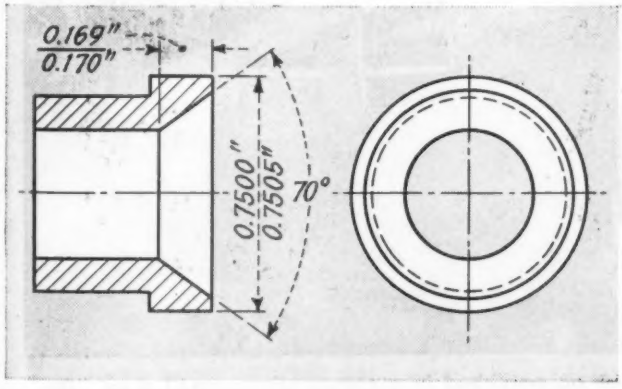
Under normal conditions of use, these grinders give excellent service even with a maximum spindle speed of 10,000 r.p.m. However, greatly expanded demands for die nibs made it necessary to use these Dumore grinders throughout two eight-hour shifts per day.

As a result, the overloaded steel ball bearings ran accurately for about a week, and then began to show signs of wear. The shaft developed a small amount of play caused by the bearing wear, and once started this would grow rapidly worse until new ball bearings had to be installed.

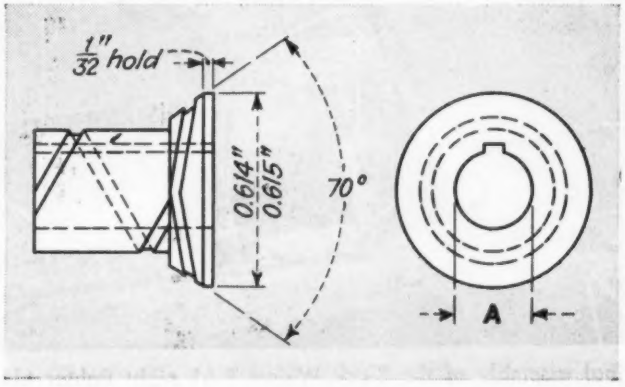
In an effort to increase bearing life, a set of cemented-carbide plain bearings with conical bearing surfaces was installed at each end of the shaft. This involved machining the shaft for the extra length of the carbide bearing members and designing the outer bearing members for a light press fit in the space previously occupied by the outer races of the ball bearings.

The inner bearings—made of grade 44A Carboloy, which combines great toughness with good resistance to wear—are attached to the shaft with Woodruff keys. As shown in the sketch, the inner bearing at the wheel end of the shaft is held in position against a shoulder by a spacer, while the inner bearing member at the pulley end of the shaft is bored for a close slip fit on the shaft and is held tightly against its mating outer bearing member by means of a compression spring and spacer tube. The outer surfaces of each of the inner bearing members are grooved for lubrication. The stationary outer bearing members are made of Grade 78B Carboloy, which is tough and wear-resistant. The conical bearing surfaces take the bearing load, while the cylindrical portions of the bearings may have a running clearance of 0.0005 to 0.0008 in. The bearings are lubricated with a mixture of kerosene and colloidal graphite, applied by putting a few drops into a small cup which permits the lubricant to reach the bearing through wicks.

These carbide-to-carbide bearings have been subjected to the same service as were the steel ball bearings—that is two eight-hour shifts per day—for more than a year. Examination has shown about 0.000004 in. wear in that time. The combination described has worked out so well that little further experimental work has been done to date on this application. It may be that other combinations of grades of carbide and design of bearing members will give even better results.



The outer bearing member has a conical bearing surface, which is lapped to an included angle of 70 deg. for a length of 0.160 - 0.170 inches



The inner member is grooved for lubrication. The bore is finished for a light press fit on the spindle at the wheel end, and for a precision slip fit at the pulley end

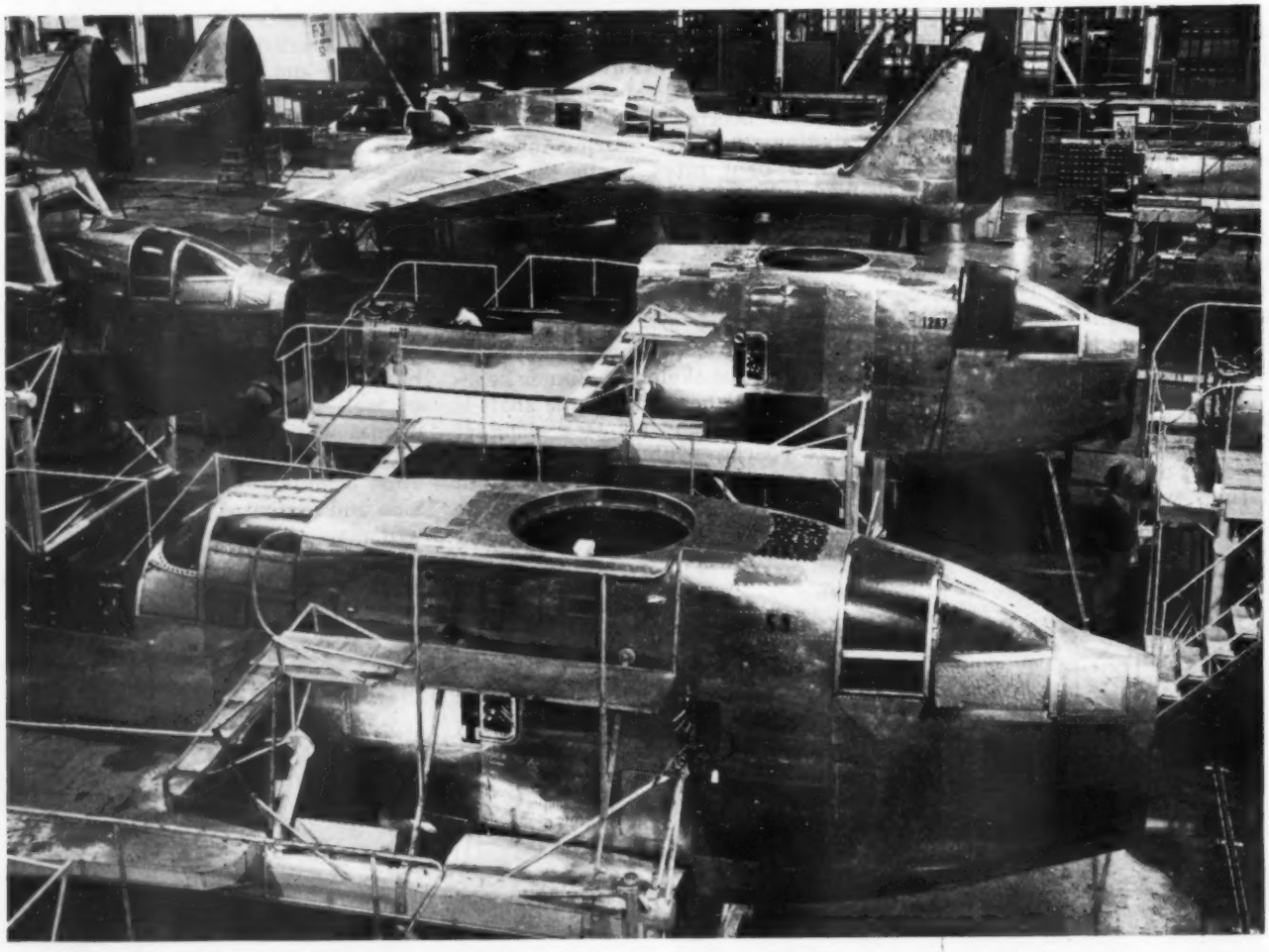
Well Planned Assembly Layout Behind the Black Widow

Specially designed dollies form part of the production planning which met assembly requirements for the P-61 night fighter

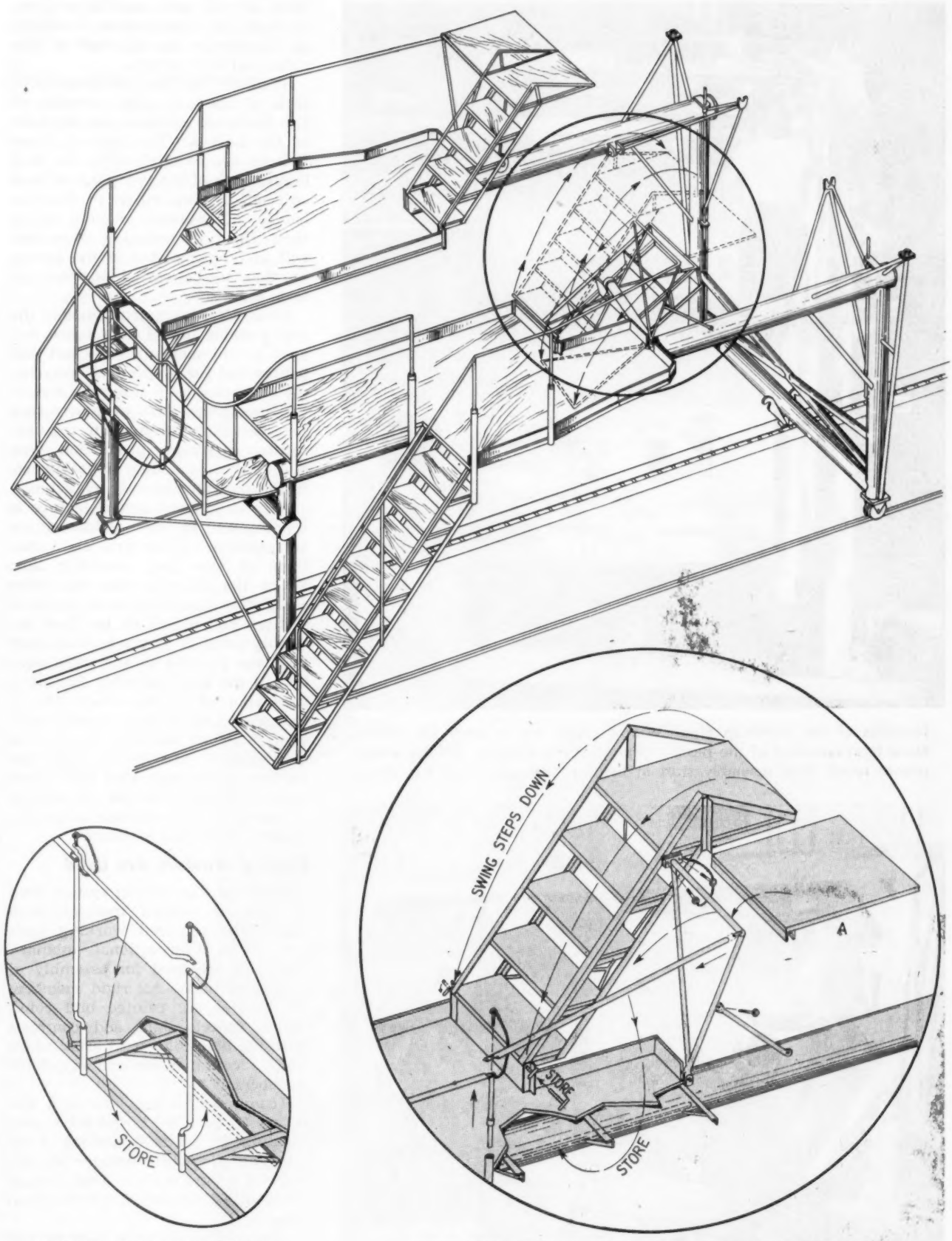
A SERIES of production problems involving small available plant space, manpower shortages and economical tooling to meet possible short runs and design changes were ironed out satisfactorily by Northrop Aircraft, Inc., in turning out the deadly night fighter plane, the P-61, known as the Black Widow.

Planning engineers devised unusual plant layout arrangements which paved the way for possible increased production with minimum expansion. The final assembly line has its principal sources in the subassembly lines on which the crew nacelle and the central body portion of the plane are built. Final assembly begins when the completed nacelle is placed upon a larger portable assembly fixture, a dolly, upon which it remains until the structural assembly of the airplane is completed by the successive addition of the inner wings, the engines, the outer wings, the booms and the tail structure.

The crew nacelle is assembled on two parallel multiple subassembly lines, one for the forward section and the other for the intermediate section. The third of the three sections into which the nacelle is divided—the aft section—is received from a vendor as a complete part.



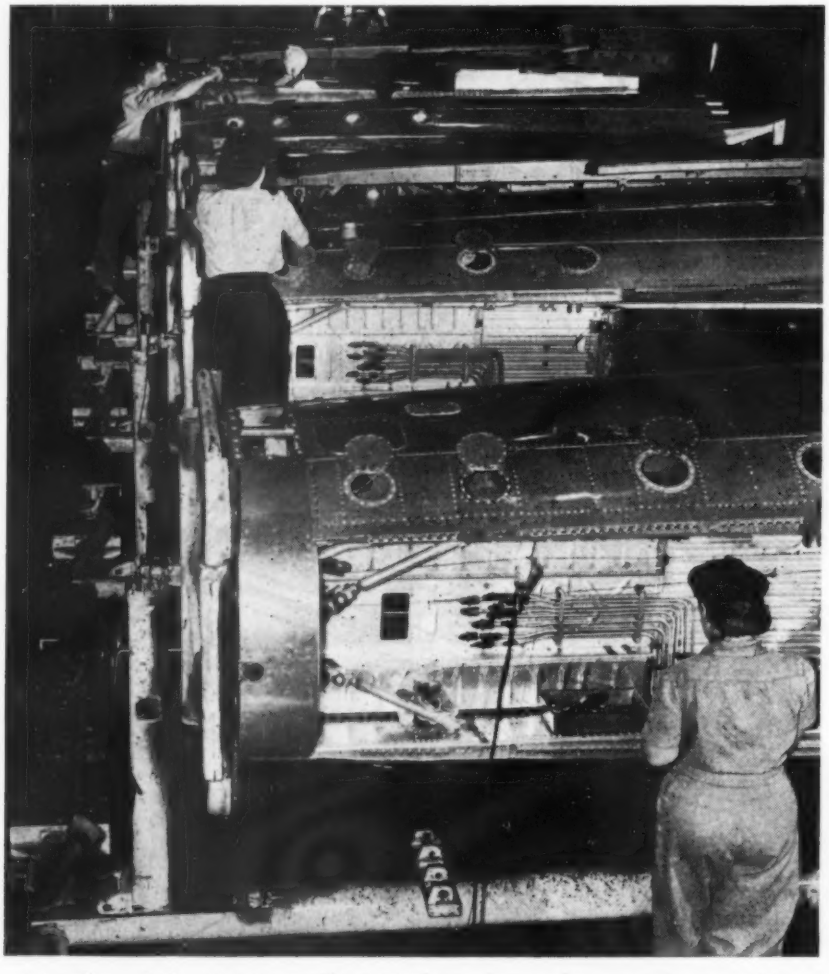
Final assembly of the Black Widow P-61 night fighter plane is accomplished in a comparatively small area. Detailed production planning eliminated waste space. Production dollies are designed to minimize space requirements, yet provide accessibility for working on various sections of the structure. Crew nacelles appear in the foreground and a more complete airplane is shown in the background receiving final assembly operations



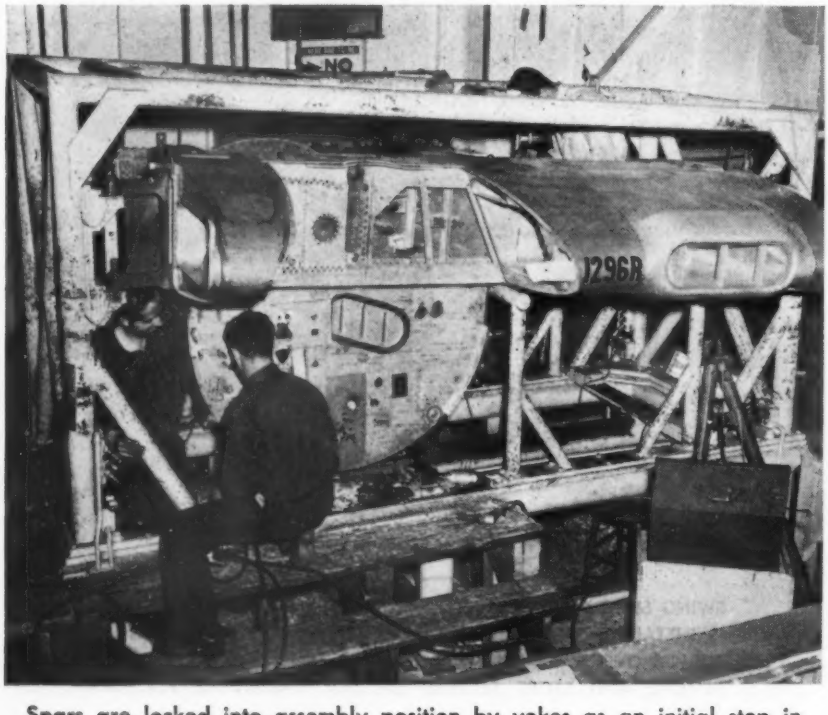
TO INSTALL THE NOSE SECTION, STORE SECTION OF RAIL DESIGNATED UNDER THE PLATFORM

SWING STEPS DOWN TO INSTALL INNER WING. AFTER INNER WING IS INSTALLED, SWING STEPS UP INTO POSITION AND PLACE PLATFORM *A* OVER RAIL AND INNER WING. AFTER ENGINE IS INSTALLED, REMOVE AND STORE SECTION OF RAIL UNDER THE PLATFORM

This is the novel dolly for assembling the Black Widow fighter plane



Nacelles of the Northrop Black Widow plane are in work on dollies. More than one-third of the plant's employees are women. U-lines where planes reach final assembly start in the far background of this photo



Spars are locked into assembly position by yokes as an initial step in the assembly operation of the inner wing structure

Each of the two nacelle sections, forward and intermediate, is divided lengthwise for fabrication into right and left halves.

Similarly, the line for assembly of each of these sections consists of two U-shaped sublines, one for each of the halves. The legs of these U-lines are parallel, with the final legs of each of the two pairs of lines adjacent to each other, so that the halves of sections moving along their lines in opposing directions will arrive completed at the proper position to be sewed together to form a section.

This U-arrangement made the best possible use of floor space, but even more important is the fact that it provided for simple and economical expansion by making the legs of the lines longer than were necessary for immediate production requirements. Increased production was met by merely adding traveling jigs to the structure already available.

A second novel layout feature is represented in the hollow-square arrangement of the first eight stations of the final assembly line. When the crew nacelle has been completely assembled from its three sections and placed on the final assembly dolly, it moves forward four positions parallel to the main portion of the final assembly line. It is then shunted to the other side of that main line where it moves backward for four positions before it is side-stepped into the straight line portion of the main line. This saved space, and permitted the installation of enough work stations to accommodate additional workers.

Control Masters Are Used

Basically, the tooling system used is that of control masters from which the required working tools are made. Conventional tubular-type jigs are used for assembly of structural parts. All rigid members of the jigs are painted buff color, which reflects light and contrasts with the blue color used as standard finish for all movable and adjustable members.

Trunnion-type jigs are used extensively, even for larger subassemblies. Large jigs hold sections of the crew nacelle while interior plumbing and wiring work is done. Nearly all welding jigs are of the trunnion type.

Accessibility of work held by jigs was accomplished by installing fixed steps and platforms at each work station. These permit easy access to the interior and elevated portions of the subassembly. Picture frame assembly jigs hold panel sides of the

nacelle sections in a convenient vertical working position, accessible from both sides. Rigid rectangular tubular frames serve in attaching jigs to the overhead conveyor.

Dollies Move Components

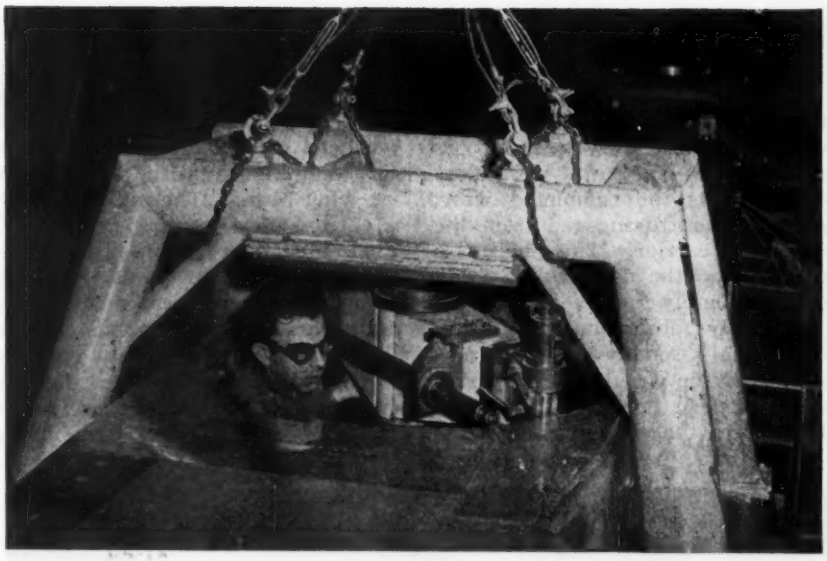
Relatively little use is made of mechanical conveyors in producing the Black Widow. Dollies, most of them moved by hand, are employed. For example, trunnion jigs that hold sections of the crew nacelle are mounted on wheels and moved by hand from one fixed work station to the next along a surface-mounted track. Major components, such as the wings, engines and empennage, are brought to their installation stations on dollies moved by tractors. The large final assembly dollies move on tracks laid directly on the concrete floor. Upon reaching straight portions of the final assembly lines, the dollies are moved mechanically by a conveyor chain between the tracks.

Strips of inverted V-angle iron form the track for the final assembly line. Hinges permit lifting away track sections at cross aisles for passage of dollies toting parts. Switch plates allow for changes in direction of dollies on the final assembly line.

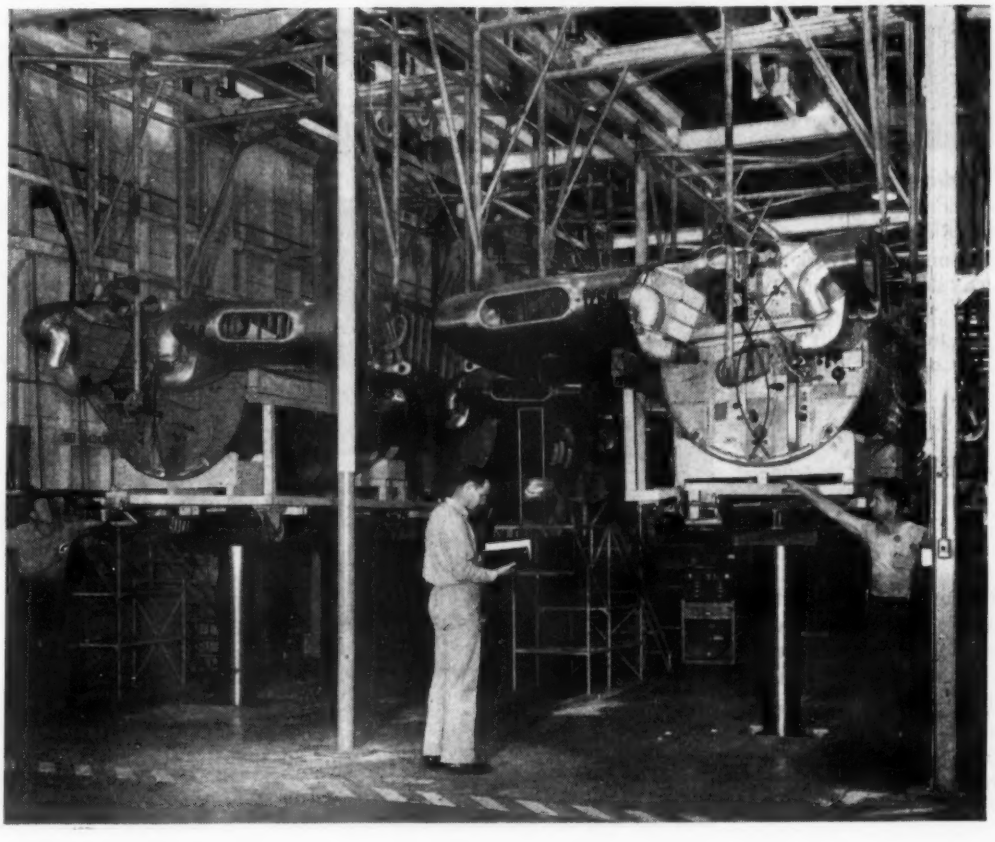
Several of the larger subassemblies are procured in completed form from subcontractors. One major subassembly which is not subcontracted is the inner wing, a complex, built-up structure described in detail in a recent issue.

When completed, the inner wing leaves the line of fixed jigs on which it was assembled and is hung on an overhead conveyor for installation work. There are two conveyor lines, U-shaped and parallel, one for right wing sections and the other for left wing sections. With the conveyor holding the wing parallel to and near the floor, the maze of tubing and electric lines that pass through the wing are installed in the interior through the open tank bays and before installation of the fuel cells.

Rounding the U-turn in the line, the conveyor rises, giving clearance above the floor for the installation



Milling of the turret ring is about the only fabrication job done on the assembly line. Rigid tubular frames serve for attaching the jig to the overhead conveyor. The portable milling machine is positioned accurately by using wing attachment fittings as locating points



Ordinary grease hoists, similar to those used at automobile service stations, are used to remove finished wing sections from the conveyor line. Dollies are rolled into position and hoisted until they engage the wing sections, which are then detached from the conveyor. The dollies are then lowered and towed to the final assembly area

and testing of the landing gear strut and wheel.

A hoist similar to that used in greasing automobiles is adapted to the job of unloading the finished wing from the conveyor. A dolly is raised by the hoist until it receives and supports the completed wing, which is then disengaged from the conveyor carrier. The hoist is lowered and the dolly rolled away to the assembly line.

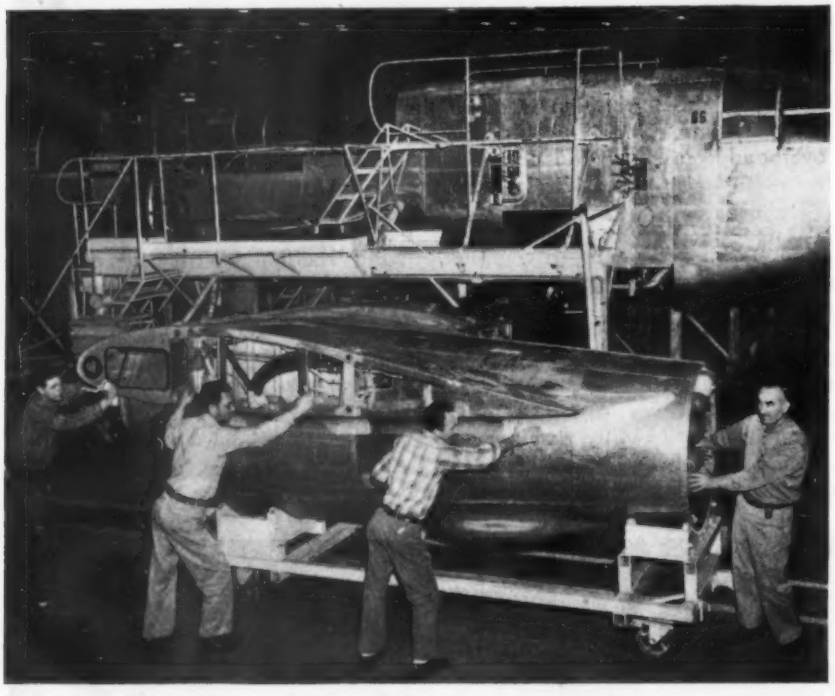
The only fabrication work done on the final assembly line is the machining of the circular bearing ring which supports the turret located on the roof of the crew nacelle. Wing attachment fittings are used as locating points for accurate positioning of the portable, rotating milling machine employed in finishing the turret ring surface. Lowered by an overhead conveyor, the rigid tubular frame of the mill is attached to the wing fittings. The milling cutter is carried on a rotating arm arbor.

Assembly operations are organized into three kinds of functional and geographical subdivisions designated as departments, zones and stations. A department consists of a group of zones or stations which have to do with a major manufacturing function; a zone is a group of working stations where somewhat closely related operations are executed; stations represent actual working points where specific jobs are done.

The zone designation was decided upon for two reasons: (1) It designates more exactly the portion of the assembly line at which a part is to be used than would be achieved by the broader departmental classification; (2) it speeds scheduling of new parts for which the exact station number might be unknown or might be subject to change because of shop needs. All shop orders and drawings relating to an individual part bear the zone designation and a "key" letter. The letter indicates the number of fabrication or subassembly operations through which a part must go before it is used on the line.

Generally, the supply of parts to the assembly lines is actuated by the same general scheduling system used for production control. Parts are kept in storage areas as convenient to the assembly line as possible.

Large numbers of completed parts, either subassemblies or boxes of small parts, are received from vendors. These all arrive at a central station for checking and are then routed to inspection stations, which are equipped with modern inspection equipment and gages. Boxes of smaller parts are moved by a gravity roller conveyor to inspection stations. After approval, boxes of parts return to the main conveyor and move to the designated zones.



Hand-moved dollies are an important part of the Black Widow production lines. Workmen are shown moving a dolly bearing an engine nacelle to its position on the assembly line

Reception center for parts received from vendors. The parts are checked, inspected, then routed to designated assembly stations. One of several conveyor lines is shown in the foreground

Practical Ideas

HAVE YOU A PRACTICAL IDEA? ... If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Blanking Dies Built Up to Desired Height With Steel Packing Blocks

BY JOSEPH CHURTON
Assistant Foreman Punch Press Department
Consolidated Vultee Aircraft Corporation, San Diego

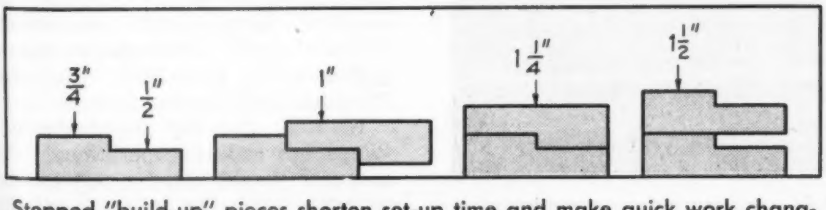
There are numerous instances where a die set is much shorter than the minimum shut height of a press when practically all of the adjustment is down. In such a case, building up under the die shoe is necessary.

To provide something more workmanlike, stepped blocks of steel were made in which the greatest thickness was ¾in. and the step was ½ in. If a build-up of ½ in. is required, then the ½ in. step is used; for ¾ in., the greatest thickness is employed; for 1 in., the two ½ in. steps are placed together; 1¼ in., the ½ in. and ¾ in. surfaces are in contact; 1½ in. brings the ¾ in. thicknesses on top of one another. Other heights can be made by piling these up or making thicker blocks with short steps.

The number of pairs of blocks used will be determined by the size of the die and the blocked-up height. A dozen of these blocks may be used in some instances, either to distribute the load or to lift the die high enough so the punch can perform its functions in the die.

By using blocks of uniform build-up heights, very little time is lost and a few standard pieces make quick work of each new set-up.

Steel stepped blocks are piled to build the die assembly to the desired height beneath the punch



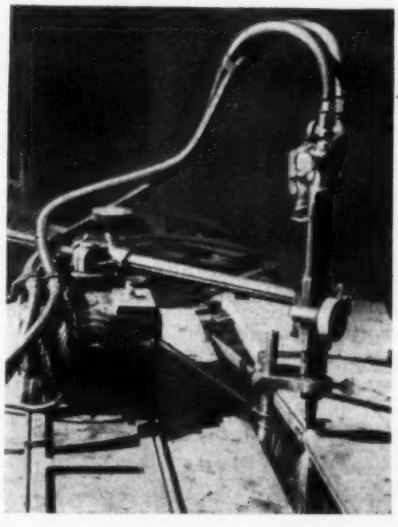
Stepped "build-up" pieces shorten set-up time and make quick work changing from one die set to the other

Fitting Edge of Plate Burnt for Union Melt Welds

BY J. E. PRICE
J. A. Jones Construction Co., Inc.
Brunswick, Ga.

It is a difficult problem to shear the edges of long plates absolutely true. The idea of bringing two plates close together and burning their edges with a double torch results in considerable loss of valuable metal and cutting gases, but mating edges are produced.

Another plan is to use the edge of one plate as a guide and cut the edge of the other to suit. This requires but one torch, a tracing finger or roller, and a means for guiding the burning machine. Outside of the fact that the machine rolls along a fixed path and the torch is supported by this machine, the actual control of the torch position rests in a finger or roller attached to the torch, but held in contact with the edge of the guide plate by a spring. The consequence is that the torch follows the irregularities of the guide plate edge because the torch arm can pivot about the machine supporting the torch.



A small guide finger, attached to the torch by a thumbscrew, guides the burning torch to cut a path parallel to the guiding edge of an adjacent sheet

When the plates are finally pushed together and made ready for welding, the joint is about as perfect as can be made; no large gaps appear,

only a crevice large enough for a thoroughly welded seam.

This process saves metal, gas, labor and fittings where long welded joints are necessary. It is applicable to deck plates, tank sheets or built up girders where the web of a wide flange section is split and a plate of web thickness is inserted to make a beam section of greater depth. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Bandsaw Miter Box Permits Cutting Matched Joints

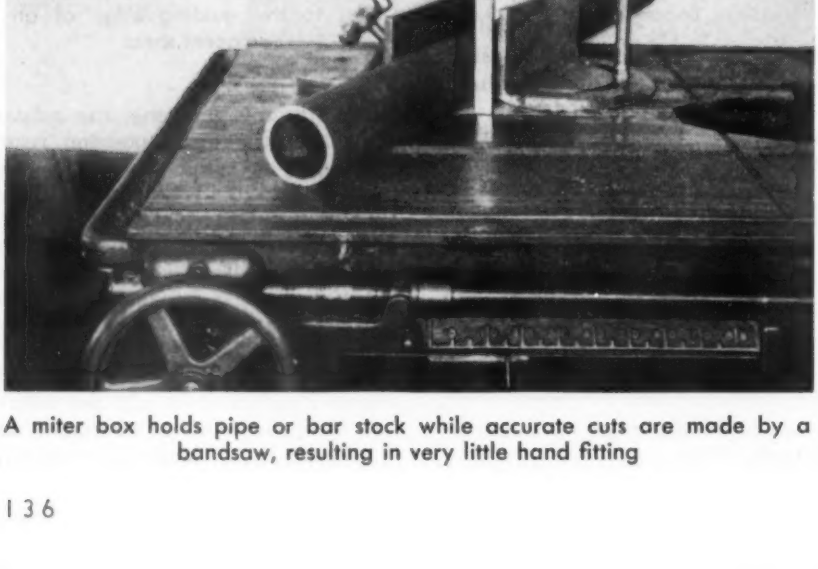
BY WILLIAM G. MERRITT
Philadelphia Navy Yard

The joining of branch pipes at angles and having them match correctly has not only required a templet but meant much hand fitting afterwards, with the prospect of a not entirely satisfactory job in the end.

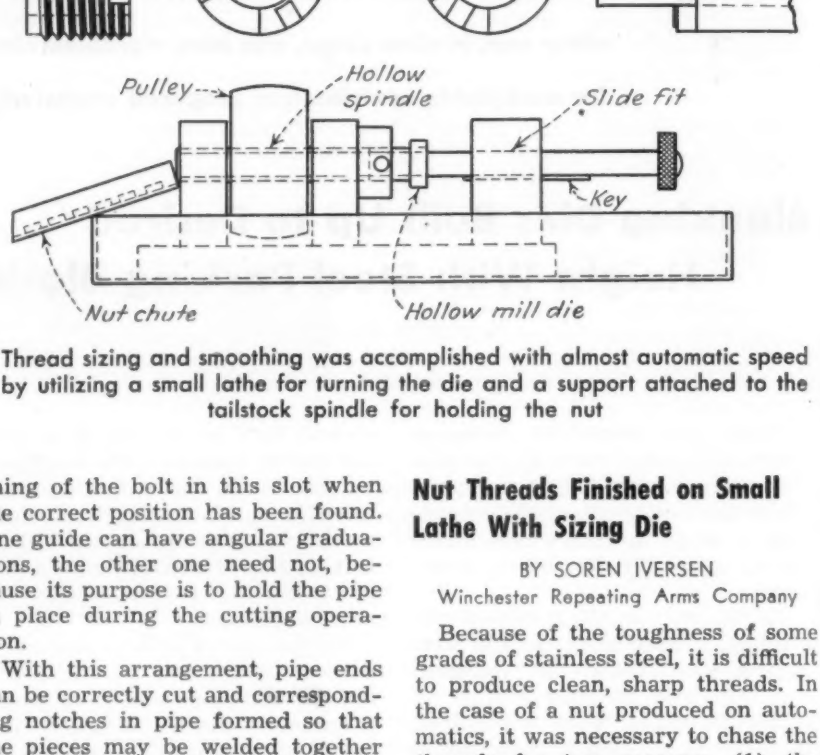
An adjustable miter box, made of two pieces of angle, mounted on the table of a bandsaw has solved the problem of making accurate cuts which would match and not require hand fitting.

Each piece of angle swivels about a T-bolt sliding in a T-slot in the table. A circular slot in the bottom leg of the angles allows freedom of angular adjustment and final tightening of the bolt in this slot when the correct position has been found. One guide can have angular graduations, the other one need not, because its purpose is to hold the pipe in place during the cutting operation.

With this arrangement, pipe ends can be correctly cut and corresponding notches in pipe formed so that the pieces may be welded together with little work. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



A miter box holds pipe or bar stock while accurate cuts are made by a bandsaw, resulting in very little hand fitting



Thread sizing and smoothing was accomplished with almost automatic speed by utilizing a small lathe for turning the die and a support attached to the tailstock spindle for holding the nut

Nut Threads Finished on Small Lathe With Sizing Die

BY SOREN IVERSEN
Winchester Repeating Arms Company

Because of the toughness of some grades of stainless steel, it is difficult to produce clean, sharp threads. In the case of a nut produced on automatics, it was necessary to chase the threads for two reasons: (1) the difficulty of getting a good thread on the automatic, and (2) three slots were subsequently milled on the end of the nut which threw burrs into the thread. A small bench machine was built so a girl operator could finish chase the threads and remove the burrs at the same time while maintaining a high production rate.

The outside surface of the nut was covered with threads; it was difficult to hold the piece for rethreading. Solution of this obstacle was obtained by using a sleeve with lugs which fitted into the slots in the nut; these lugs would hold the nut stationary while the threads were being cut. Centering was obtained by a snugly fitting plug entering the hole in the nut; the nut plunger assembly was held in the tailstock spindle. A key guides the tailstock spindle but permits longitudinal movement. Mounted on the lathe spindle was a hollow-mill threading die for smoothly finishing the threads.

Without stopping the lathe between threading operations, the operator would place a nut on the plunger, move the tailstock spindle to feed into the die and follow

through until the nut left the die; this process was repeated for each nut. The recently threaded nut pushed the one ahead of it through the hole in the spindle, then they were discharged into a receptable.

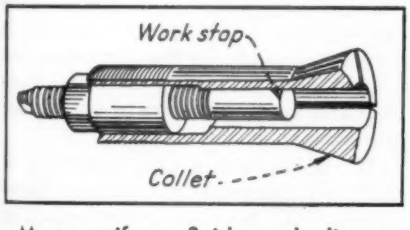
This method answered an otherwise perplexing problem because rough threaded pieces could be sized rapidly and in quantity without going to much expense. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Internal Lathe Collet Stop Locates Short Pieces Accurately

BY ALEXANDER J. BOWDEN
Glenn L. Martin-Nebraska Co.

For short runs of pieces where the quantities are not great enough to set-up an automatic machine, some means of accurately locating the article for length is of value.

To secure a fixed position in a collet, a stop with an adjustable screw has been made. The base is a bushing turned to a slight taper to fit tightly in the rear end of the collet; an adjusting screw with a locknut is threaded through the bushing. Adjustment of the stop is made by using the screw, and the locknut is turned until it is tight.

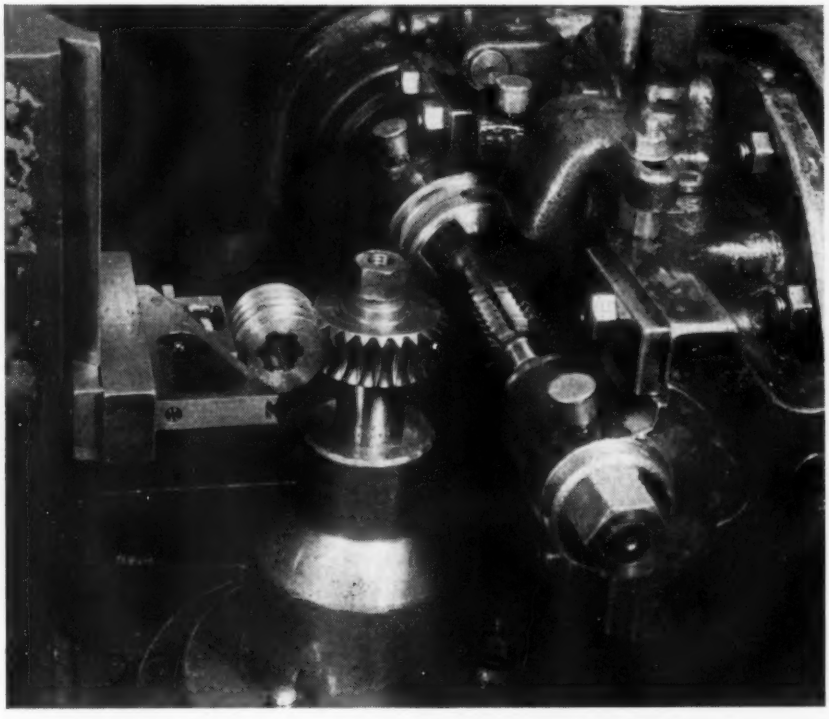


More uniform finish and dimensions result when a stop is used

then the collet is placed in the lathe spindle and the draw tube screwed on the collet.

Short work, such as cutting off and facing pins or bushings, or second-cut rework is done very quickly with this arrangement, because the pieces are set against the stop and all external work is done at a predetermined distance, resulting in a more uniform product.

Set-up time has been reduced as much as 90 percent, but the machining time has not been changed. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Planer gage checking of gears, while they are in the machine, promotes accuracy and reduces cost

Gears in Hobbing Machine Checked with Planer Gage

BY EDGAR P. WETZEL
Navy Yard, Washington, D. C.

For smooth running gears, without backlash, the pitch diameter must check within close tolerances. Usually, checking is done with the gear out of the machine; if more stock must be removed, much time is lost in trying to pick up the cut.

To avoid loss of time and provide a means for accurately checking a gear while it is set-up in the machine, an adjustable parallel or a planer gage was used.

For a measuring base, the arbor support of the hobber was utilized. On the finished face of the arbor support was bolted an accurate parallel bar, which could be adjusted along the ways to suit the position of the gear face.

If a worm gear is to be verified, a worm of correct dimensions is meshed with the worm heel, then the planer gage is adjusted to a nice fit. The gage is measured with a micrometer.

The distance from the face of the arbor support to the center of the gear is known, the thickness of the parallel bar has been established; from the drawings, the center distance of the worm pair can be found as well as the outside diameter of the worm.

For determining whether more metal must be removed, this procedure is used—the sum of the gear pair center distance, half the outside diameter of the worm, the planer gage and the parallel bar should equal the distance from the center of the gear to the face of the arbor support. The distance from the face of the arbor support to the gear center, the parallel bar thickness, and the worm wheel diameter do not change; the variable dimension is the pitch diameter of the worm wheel, and this is measured by the planer gage. Once the correct height of the planer gage has been found, ordinary subtraction will give the distance the hob must be moved to cut to the correct pitch diameter of the worm wheel.

It will be noted that the hob and gear have not been out of contact during the process, so the machine can be started at once, if necessary.

This system saves about 50 percent of the checking time, without including the loss in setting-up.

The same plan can be used for spur and helical gears. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Heavy Brake Forms Ends of Sheets in One Stroke

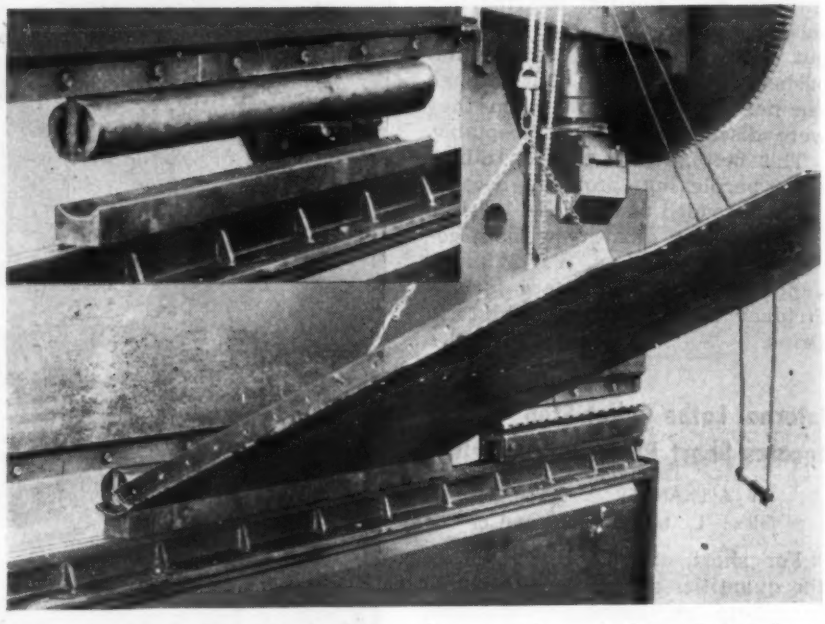
BY JOSEPH WILLIAM WEBB
Illinois Central System, Chicago

Steel plates have wide application in the manufacture of modern rolling stock. There are many flanging operations and numerous curved parts with rather odd shapes. Forming right angle bends is a simple operation, but to roll an edge may require several strokes of the press or, with a few simple tools, a single stroke will do the trick.

Since a brake has a long, narrow bed and slide, the punch and die are relatively simple. The die is formed concave to a curvature slightly less than the finished radius, because the sheet must be over-bent to allow for springback after forming. For the same reason, the punch radius is smaller than called for. Before forming, ram adjustment must be made so that the punch will not hit the metal too hard or else the press may open up and be broken. With this type of punch and die, one stroke forms the end to the correct curvature.

A block and fall handles the plate into the brake. As the punch comes down and forms the rolled edge, the free end of the plate rises.

This method is simple and less expensive than to make large punches and dies at great expense requiring a very large and powerful machine.



When the punch descends, the free end rises as the end of the sheet is bent to shape, because of the bending taking place between the punch and die

For parts where the quantity is not large enough to warrant an expensive outlay in machinery and tools, a brake often proves to be a universal machine which can be economically adapted to a multitude of uses.

With this type of machine, expensive punches and dies are unnecessary, very little labor is required and work is rapid. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Set-Up Table Used for Checking Gang Mill Assemblies

BY LINTON W. YARBROUGH
North American Aviation, Inc., Dallas

Gang milling cutter assemblies are very often made up on the machine.

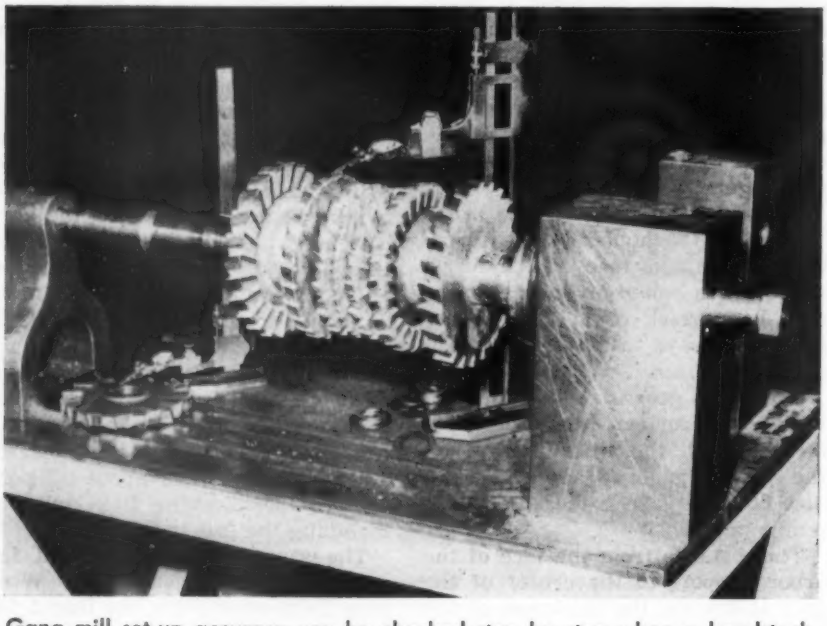
To assure accuracy, each diameter step must be accurately checked and the spacing must be correct. This means that a selection of cutters is necessary to obtain the correct depth of cut and shimming between cutters and spacing collars to very close dimensions is mandatory.

If the assembly and checking is done on the milling machine, three hours will pass only too quickly. Trial cuts, for verification of dimensions, may result in scrapped pieces.

With the aid of a baseplate to which are fastened a fixed headstock and a sliding tailstock, the arbor can be fitted into the headstock and supported by the tailstock center; each cutter, spacer or shim can be checked individually as each part is assembled. If this work is done in the tool crib, the proper selection of parts can be made and the responsibility localized.

After the group has been checked, it can be stocked the same as any other tool and given to the machine operator whose only function is to place the arbor in the machine and perform the necessary motions.

The reduction of labor, improve-



Gang mill set-up accuracy can be checked step by step when a headstock and tailstock are used in the tool crib

ment in accuracy and the avoidance of shut-down time is very noticeable. Making-up and checking the assembly in the tool crib requires about one-third the time usually necessary for the previous method. *War Winning Suggestions from the Board for Individual Awards, War Production Drive.*

Piston-Ring Burrs Removed by Automatic Chamfering Machine

BY O. V. ROKOS
Washington Navy Yard

Piston-ring castings are received from the foundry as a long sleeve with a flange or lugs to hold the rough tube in position on the faceplate or in the chuck. Outside and inside diameters are machined to size, then oil grooves are cut in. Finally, the parting tools sever each ring in turn. The inside edge always has a burr, because the cutting tool can never remove this metal. To obtain a satisfactory product, a burr-removing operation on a separate machine is necessary.

★

War - Winning Suggestions

appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive and the Navy Board of Awards to Civil Employees. They are freely offered to industry as an aid to war production.

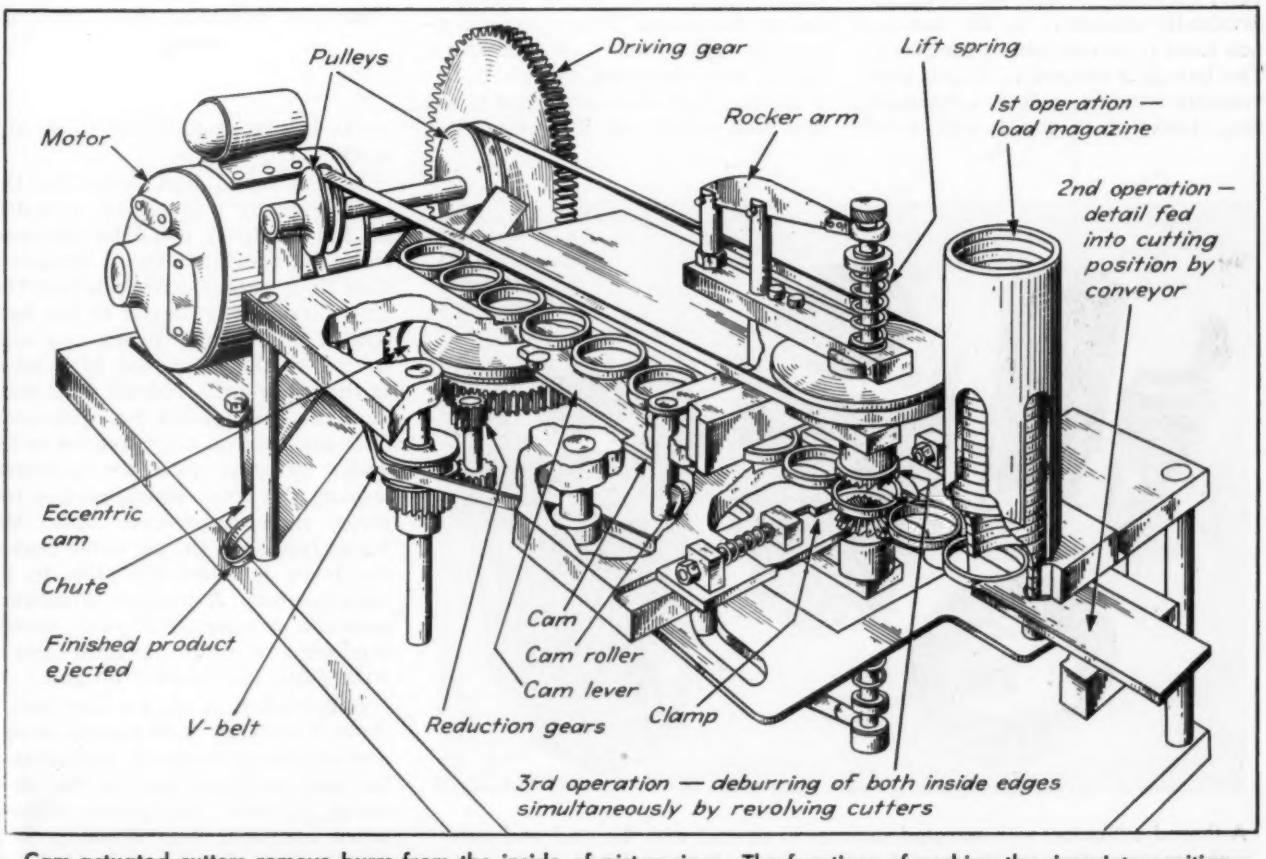
★

For high production, work must be done on both sides of the ring at the same time, requiring two cutters operating simultaneously, but rotating in opposite directions.

A burring machine has been placed in operation which has two bevel cutters for chamfering the inside edges. A small motor drives a large gear mounted on a countershaft. A grooved pulley fastened to this reducing gear furnishes the drive through an endless V-belt. The drive begins with the grooved pulley on the countershaft, turns about the grooved pulley driving the upper burring cutter, returns to a grooved pulley running loose on the countershaft, then goes to the grooved pulley turning the lower cutter in a direction opposite to the top cutter, and finally returns to the driving pulley.

Feed for the cutters and rings is through a reduction gear and cam driven by the endless V-belt. On the low speed of the reduction gears is a cam which serves three purposes. One is to feed rings into position for burring, another is to move the deburring cutters together simultaneously, and the third is to hold the rings tightly during machining—the most important function.

Loading the magazine is done by hand. The cam slide moves a ring into position, then closes the clamp. Whereupon the cutters are moved into position and retracted, the clamps are opened and another ring, going into position, pushes the de-



Cam-actuated cutters remove burrs from the inside of piston rings. The functions of pushing the rings into position, closing the clamps, moving the cutters into and out of contact are all automatically controlled

burred ring ahead of it. Eventually, finished rings are discharged from a chute into a receptacle.

Previous methods produced 1200 pieces per shift per worker. With the automatic machine, output of 10,000 rings per shift per operator is common. *Suggestion Submitted Under the Navy Employee's Suggestion Program.*

Stud Extractor Removes Stubborn Studs Without Breakage

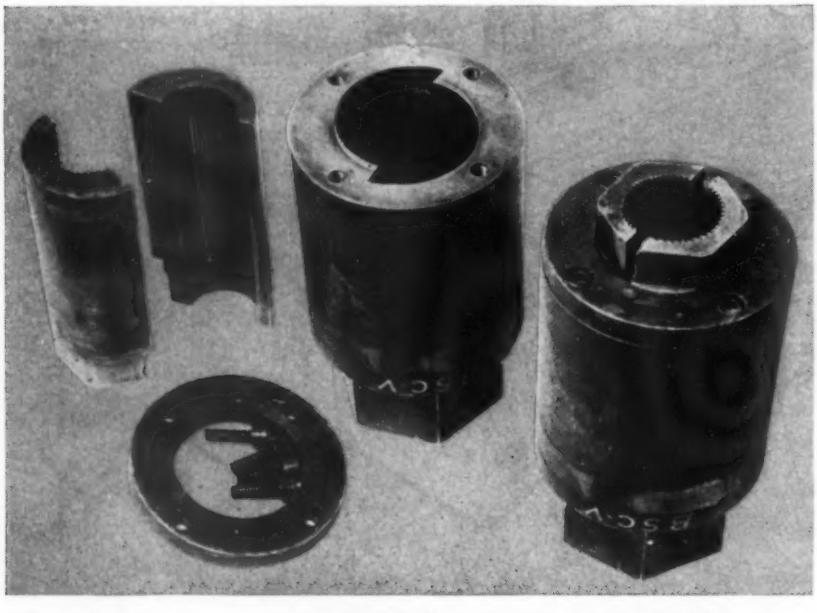
BY F. K. MITCHELL
Bethlehem Steel Co., Shipbuilding Div., San Francisco, Calif.

When disassembling heavy oil engines, many hundreds of studs must be removed. Because these studs were turned home tightly and heat has had an opportunity to oxidize the metal, much difficulty is encountered in removing them. Many studs are broken in the process, necessitating drilling out, then retapping in an effort to clean out any stray metal and leave sharp threads.

An extractor has been made which consists of two semicircular portions with internal axial serrations. The outer surfaces of these pieces are individually eccentric to the bore; a hex head is on one end of the pieces. The barrel is shaped to fit the individually eccentric pieces; a retaining ring, fastened to the barrel, holds the serrated segments in position.

To remove a stud, the extractor is placed in position and a large wrench is used to apply force. As the extractor is turned, the teeth dig deeply into the stud, applying a uniform pressure all around the stud surface, giving less tendency to bend and break the stud. The greater the applied force, the deeper the teeth enter, and the less possibility for slippage or breakage, with fewer sheared studs to be removed, drilling and retapping holes is eliminated and this delay avoided.

This extractor has been so successful that over 100 manhours per ship are saved. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

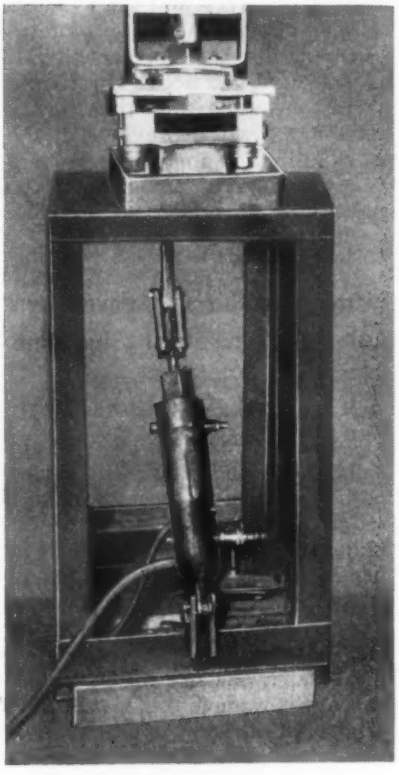


A thread extractor, with serrated surfaces in contact with the stud and outer surfaces operating on an eccentric, grips the stud more tightly as pressure is applied

Power Driven Kick Press Reduces Operator Fatigue

BY MARTIN H. SWAN
Douglas Aircraft Co., Inc., Chicago Plant

For light operations requiring pressures greater than can be exerted by hand, the kick press has found rather wide use in manufacturing operations. Where fairly continuous operations are necessary, this is very tiresome, especially because the machine is equipped to use one foot only, and the other foot never has an opportunity to do any work.



Kick press operation by mechanical power has shown a great improvement in operation over manual energy

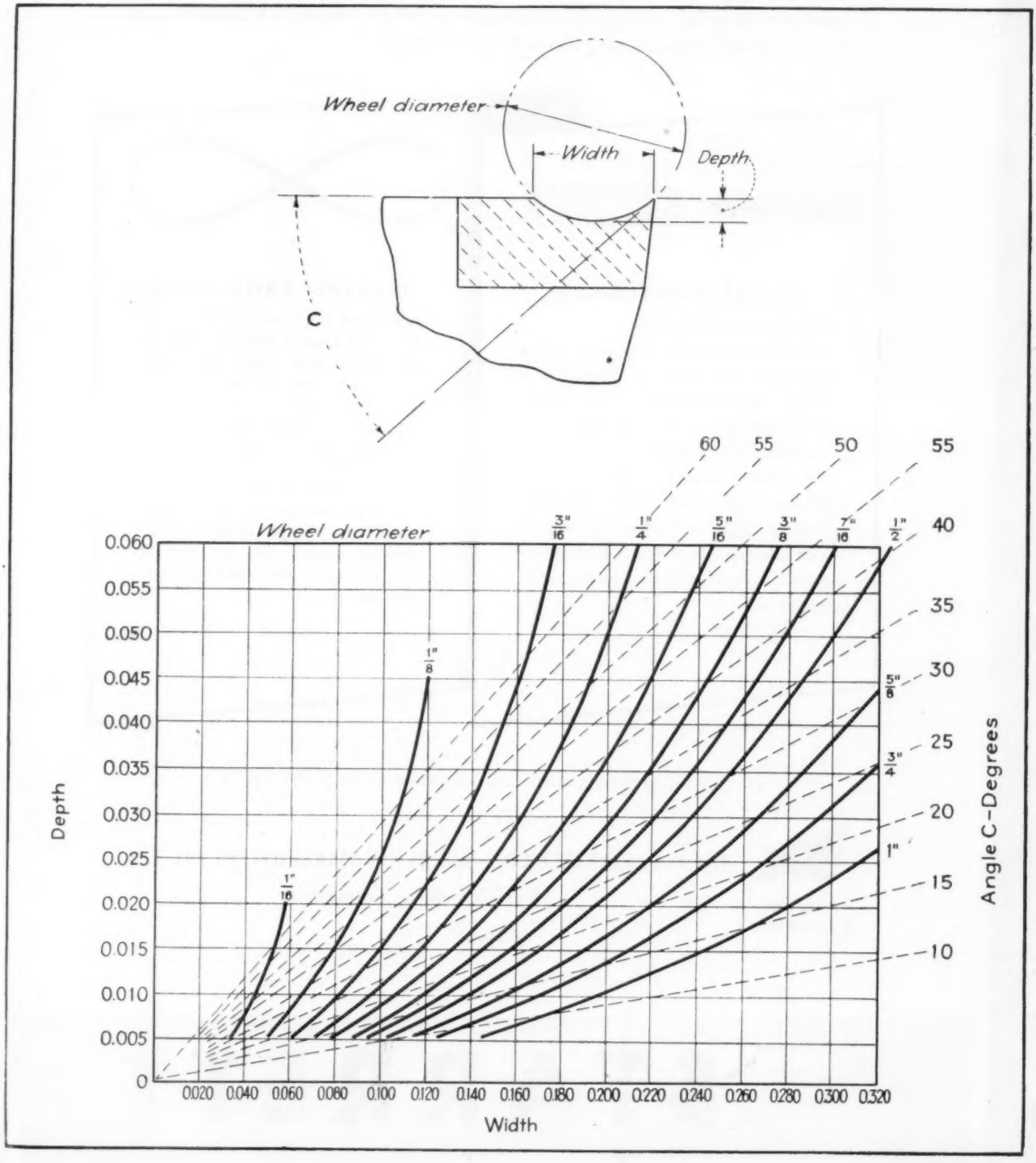
It was found that operating the kick lever by a small air cylinder, all the drudgery could be removed from the operation and a considerable time saving accomplished. The air cylinder was hinged to the bottom of the machine frame and connected to the shortened kick lever at the other end. A small foot operated valve completed the equipment. Foot pressure on the valve let in air under pressure into the cylinder, moving the lever which pushed the press slide downward upon the work; release of the air valve caused the lever to move the slide to its open position. A constant downward pressure is exerted at each stroke, producing a more uniform article with much less worker fatigue.

Substitution of air for foot power showed a saving of 40 percent in operating time, without considering the fact that any one in the shop could operate the press without much exertion. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Chip Curler Chart

BY BRUNO HOLMSTROM, TOOL SUPERVISOR, HEALD MACHINE COMPANY

The accompanying chart is used in our plant to obtain a given amount of rake without creating a chip pocket. Thus, it is possible to control chip size, and if the curler is tipped 2 to 3 deg. either side, the chip will be conducted in the desired direction.



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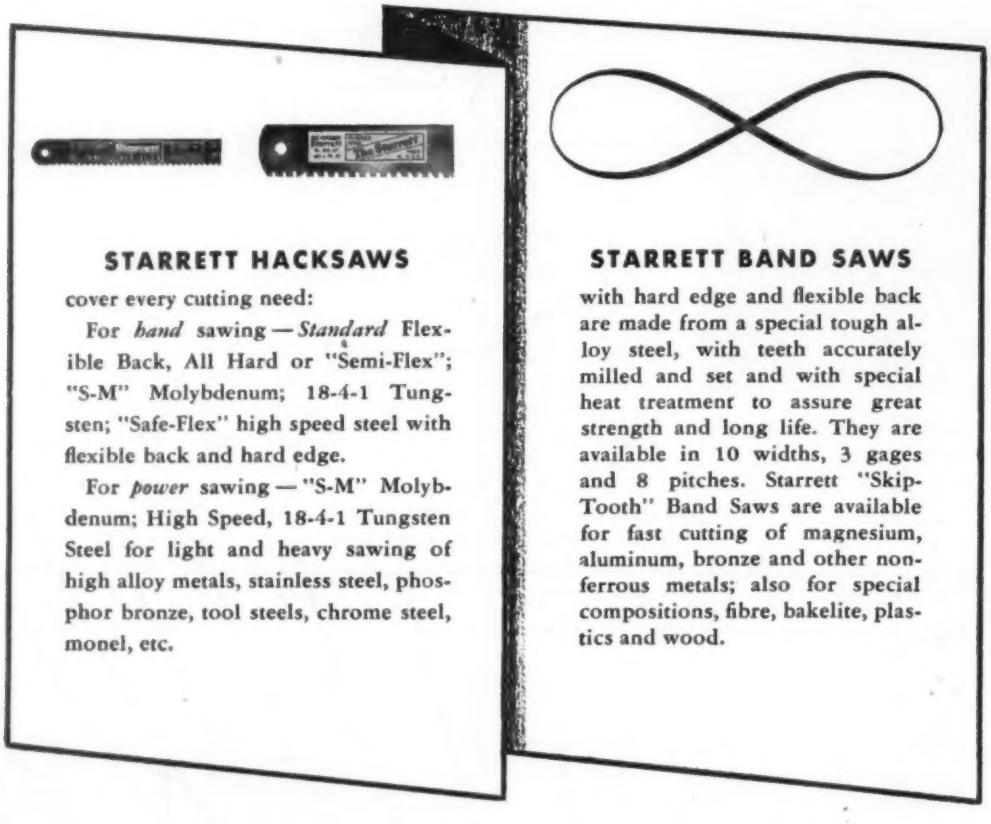

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Calculation of Circular Form Tools

COURTESY MARCHANT CALCULATING MACHINE COMPANY

SINCE most circular form tools are set below the center of the work, it is necessary to calculate dimensions of the various cutting edges so that they will turn properly the several diameters on the part. This is particularly true when the tool has top rake.

The accompanying illustrations gives an example of such a part and the arrangement of the work and forming tool. Four diameters—0.100 in., 0.150 in., 0.210 in. and 0.350 in.—are to be produced by the single tool. It is known that the tool diameter is 1.750 in. for turning the 0.100 in. diameter, that the rake angle is 10 deg., and that gash, or distance below center, is 0.125 in. Then, for every diameter on the part it is necessary to find the values of S, m, n, r_1, and d_1.

The constants for any tool-work combination are:

$r = 0.05$ in. $R_1 = 0.875$ in.
$E = 10$ deg. $G = 0.125$ in.
$\sin E = 0.173648$ $\cos E = 0.0984808$

The derived constants are as follows:

$$\frac{G}{R_1} = \frac{0.125}{0.875} = 0.142857$$

$$\text{Cos } F = \cos \sin^{-1} \frac{G}{R_1}$$

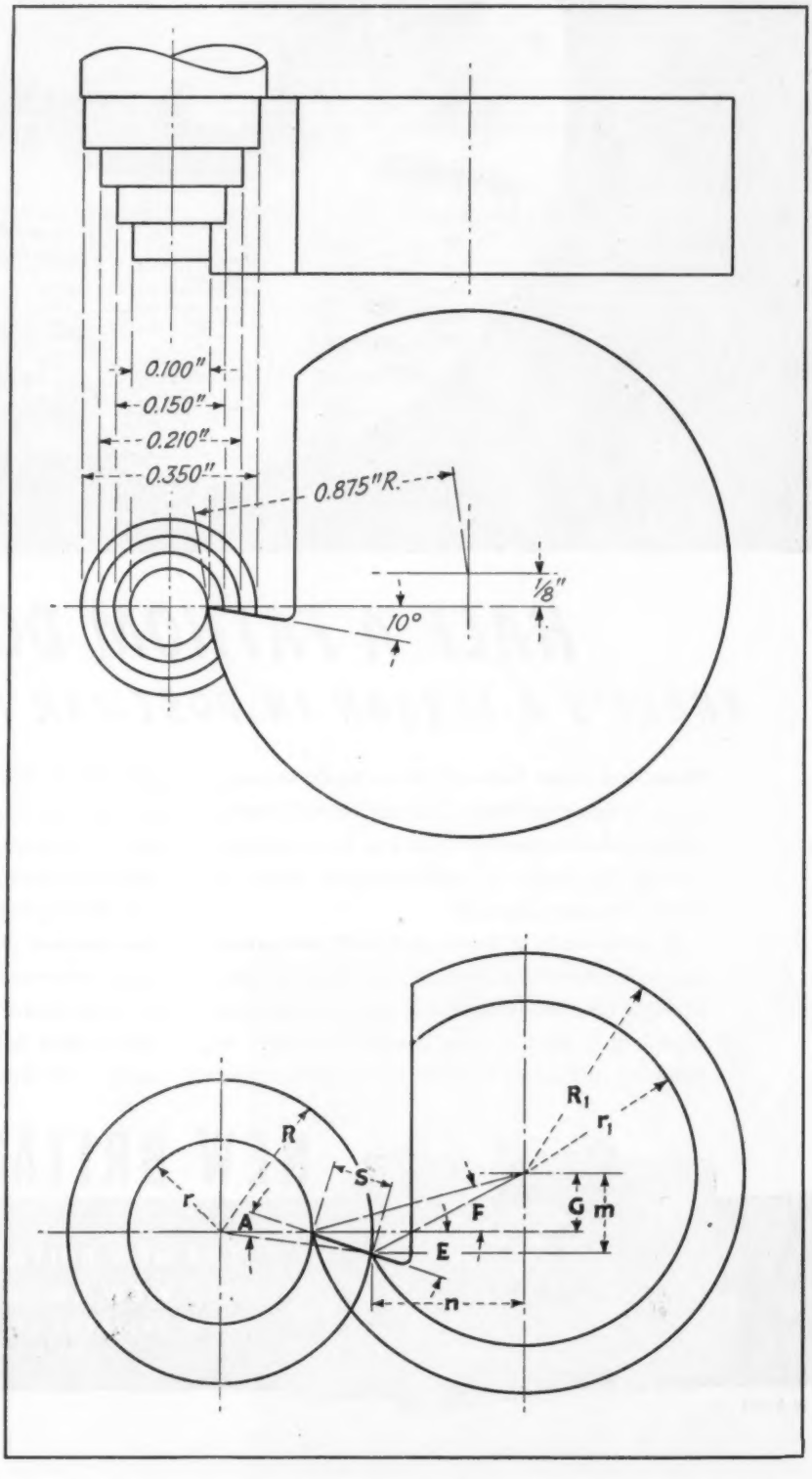
$$= \cos \sin^{-1} 0.142857 = 0.989743$$

$r \cos E = 0.05 \times 0.984808 = 0.0492404$
$R_1 \cos F = 0.875 \times 0.989743 = 0.866025$
$r \sin E = 0.05 \times 0.173648 = 0.0086824$

Calculations that involve R are given below:

$r \sin E/R = 0.0086824/R$
$\text{Cos } A = \cos \sin^{-1} (r \sin E/R)$
$S = R \cos A - r \cos E$
$= R \cos A - 0.0492404$
$m = G + S \sin E = 0.125 + 0.173648\ S$
$n = R_1 \cos F - S \cos E$
$= 0.866025 - 0.984808\ S$
$r_1 = \sqrt{m^2 + n^2}$
$d_1 = 2\ r_1$

In working with these equations, it is helpful to have a six-place table of natural sines and cosines, and the labor of making the calculations is reduced if a calculating machine is used.



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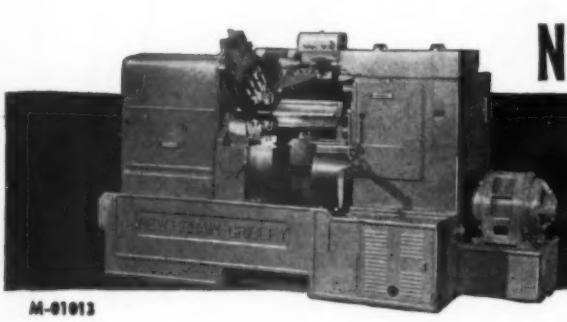


M-81013

NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

Gaging Business

Reconversion Headaches

Expectations that reconversion to civilian production would be swift and simple are undergoing several revisions in the light of the economic indigestion now attacking industry. Some government officials are just beginning to realize that reconversion is not simply a matter of lifting War Production Board controls. Labor trouble, reconversion pricing questions, doubts about surplus disposal are hampering business planning. Moreover, since business now has to worry about the cost involved in civilian goods production, it may be apt to be less inclined to improvise when material and equipment are lacking, as it did when the nation was swinging into war work.

Labor difficulties loom as a major reconversion deterrant. In recent weeks, strikes in steel plants, tire factories, and other industries producing materials and items urgently needed in reconversion, have caused the loss of considerable production. The strike at the Goodyear Tire & Rubber plant in Akron cost the nation 16,000 tires a day; steel strikes cost reconversion thousands of tons of steel that might have been available during the July quarter, which marks the beginning of the reconversion program. Unions realize that lower take-home pay is in prospect as overtime diminishes, the work-week is shortened, and temporary lay-offs for reconversion take place. Appreciation of the seriousness of this situation by legislators may mark the enactment of legislation to diminish the detrimental effects that labor strife may have upon the nation.

Tools Not Problem

Reconversion machine tools are not likely to be a problem, however. One reason for this stems from the recent cancellation of $60,000,000 in Russian lend-lease tool orders. Accordingly, it is expected that the bulk of the $40,000,000 in machine tools, rated AA-3, needed by the auto industry will be delivered by October. Motor car makers had insisted upon delivery in August, but that time-table was considered impossible by Washington.

Among top machine requirements specified by the auto industry were some $12,000,000 in heavy presses. The critical situation of presses seems to be easing and automotive tooling will not be retarded seriously for lack of them. Auto plant line-ups will not be ideal, to be sure, but auto companies will have enough stamping press facilities to get along.

Eight Month's Backlog

Right now the tool industry has an eight month backlog. Unfilled orders at the end of May totaled $275,000,000, as compared with that month's shipments of $39,825,000. Of total unfilled orders, about $95,000,000 consists of unrated business. Aside from reconversion tool orders, and some French and Belgian orders, rated AA-3, the industry also has some $100,000,000 in high-rated military business.

Military orders are largely for delivery over the next few months, and reconversion shipments are being fitted into tool builders' schedules with this factor in mind.

Russian Business Doubts

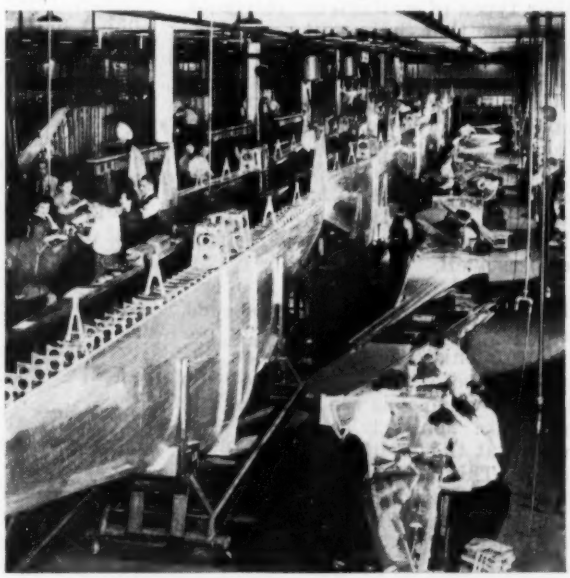
The cancelled Soviet orders have thrown the industry into a muddle and, for the time being, have put prospective French and Belgian business into an uncertain status. Soviet government officials are reported to have been offered a time payment plan extending over a long period of years, but the offer was rejected. It is believed that Russia eventually will buy what she wants for cash and will demand speedy deliveries.

The French would like to get $15,000,000 of the machines originally earmarked for Russia. Belgium wishes a smaller amount. The French actually have placed in this country $32,000,000 of AA-3 rated orders in connection with an urgency program for railroad, bearings and automotive plants. However, Paris has notified the French Commission in Washington that some orders needed quickly were allotted to British builders who could make better deliveries than American companies. The French are now in the midst of awarding to American builders $25,000,000 more in machine tool business. The French orders are being placed under a lend-lease agreement that calls for a payment of 20 percent cash upon delivery and the balance in annual payments over 30 years. The interest rate is 2⅜ percent.

Latin American Prospects

Although Latin American tool needs have been set very high to help industrialize those nations, postwar tool business may suffer in the economic tug-of-war some of these nations may wage with the United States to apply pressure in certain directions. For some time, Latin American nations have been trying to secure increases in the U. S. price for their coffee and other commodities. It had been predicted that some attempt would be made to keep out American products from some of those nations via legislation or high tariffs to bring pressure to bear in favor of higher prices.

In late June, these predictions began to develop. Brazil banned the import of used or reconditioned machines on the ground that efficient machinery is essential for the rational development of its industry. Chile is said to be discouraging its businessmen from purchasing used machinery, although it has made no official announcement in that connection. While these moves may have been designed to keep out surplus American tools, they offer an indication of the potential economic steps that may be taken against us.



Continuing War Work — While other plants are able to reconvert to civilian production, some concerns continue working on essential war items. Assembly of B-29 stabilizers at this Briggs plant is only one of the many war items being turned out in the Briggs Manufacturing plants.

Expansion, Improvement in Flat-rolled Steel Capacity Begins

New electrolytic lines, more cold-rolling mills, and greater capacity for galvanized flat-rolled products being planned. Disposal of government-owned steel plants still uncertain, delaying new equipment orders

PITTSBURGH—To meet the expected heavy postwar need for sheets and to counter competition from other metals from here on out, the steel industry is unfolding a peacetime expansion program in light flat-rolled products. Impatience at the slowness of some war cutbacks to trickle through to the mill level, and the realization that some other metals will be available for civilian production sooner than steel, have spurred the industry's expansion plans. New facilities will also be designed to exploit wartime advances in steel technology, thus aiding further in preserving the industry's prewar markets.

The light flat-rolled market ranks first and foremost among producers, who are planning to turn out more and better sheets as soon as possible. In recent weeks, there have been two contracts placed for new four-high cold mill trains, one by Granite City Steel and the other by Bethlehem Steel. Other steel producers will try to get on the books of the big equipment companies before extensive foreign orders for such items are placed by the many nations with postwar development programs.

Large Tin-Plate Program

Perhaps surpassing sheet plans in importance are coming developments in tin-plate equipment. Most companies in the field plan to enlarge their tin-plate capacity to such an extent that it would appear that cans are destined to crowd out other types of containers. However, it may be that there will be a place for more tin-plate and competitive containers will have their field, too.

U. S. Steel will enlarge tin-plate capacity at three points—Pittsburgh, Chicago, and Birmingham—in the form of new mills for rolling light gauge steel. Weirton, Jones & Laughlin and others are contemplating expansion in the tin-plate field, as well.

New cold-reduced mills for tin-plate will have extraordinary speeds, probably as much as 5,000 feet per minute. This has never been attempted before, but it is not too startling when it is realized that the maximum speed is 3,900 feet per minute at the Irvin Works in Pittsburgh. This is Irvin's potential, although working speed is around 3,200 feet per minute. The aim of these fast mills is not only economy, but also the meeting of flat steel needs by the electrolytic plating lines which operate faster than the hot-dip process used to permit.

More Galvanized Steel

Another postwar development will be the galvanizing of more steel than ever before. An electrolytic process will provide a more economical process for galvanizing. However, U. S. Steel and at least one other big steel company are installing experimental lines for the hot-dipping of coils in a continuous process. This may permit the galvanizing of material over 22 gauge.

Although the industry's plans for other mill divisions are not so clear, some fundamental changes will be made in production methods requiring new mills. Some producing units are obsolete or have been worn out during the heavy war operations, and the replacement of such units will afford opportunities for improved production methods. As an example, mills are seeking a more economical way to make bars, since it is frequently said that there is "no money in bars." Since postwar competitive conditions may hold prices down, improved equipment or technology might provide relief.

Equipment Outlook Uncertain

The outlook for heavy mill equipment concerns is both rosy and uncertain. The amount of business in prospect promises to be huge, but doubts and difficulties are expected, too. Equipment companies don't know when the domestic buying program for new mills will get underway in earnest, but fear that it will conflict with foreign business. Both English and French commissions have been in the United States studying mills and announcing intentions to buy. The Russian program alone is known to be huge. Credits are also a problem on foreign business.

Since the RFC has declared a $7,000,000 blast furnace in the Pittsburgh area surplus, the industry may be able to learn how much of a discount from original cost the government will offer for its surplus steel plants. There is a possibility that some of these units will be dismantled and shipped abroad. In any event, until government policy is more clearly delineated, domestic steel concerns may hold back on some new equipment orders.

Auto Industry Decentralizing, Expanding; General Motors in Lead

DETROIT—Prospectively large postwar markets for autos will enable the auto industry to undertake a substantial amount of plant expansion and decentralization. Besides wishing to make large savings in freight rates, auto companies feel that a more even geographical distribution of dollar output would aid the American economy, and enable the industry to split up its big units into smaller, integrated ones, if and when necessary.

General Motors is leading the way in planning for new plants. For one thing, a chain of assembly plants will provide regional set-ups at Boston, Wilmington, Del., Kansas City and maybe on the Pacific Coast. GM will probably abandon its Buick-Oldsmobile-Pontiac interchangeability as soon as volume production is reached. B-O-P is being used now.

Special Chevrolet Units

Chevrolet is reported contemplating assembly plants for its new light car separate from those for its standard models. One of these plants will be built at Flint, another at a site already owned in Cleveland and at one or two more spots yet to be picked. No change is expected to be made in the prewar chain of assembly plants—at Flint, Mich.; Norwood, O.; Janesville, Wis.; Atlanta, Ga.; Tarrytown, N. Y; St. Louis, Mo.; and on the West Coast. It seems likely that the Navy will continue to use the former assembly plant at Baltimore for at least a year or two after the war. Chevrolet sold its assembly plant at Buffalo to the government at the beginning of the war and now is trying to buy it back.

Other Expansions

General Motors will build a new hardware plant at Hamilton, O., and a stamping plant at Columbus, O The corporation's Ternstedt Division faces the strong possibility that the Navy may not release for an indefinite period the Ternstedt factory at Trenton, N. J. General Motors has acquired land at Sandusky, O., for a new so-called stand-by plant for its New Departure Division for production of bearings. It also will erect a new battery factory at New Brunswick, N. J., abandoning its former battery plant at Bloomfield, N. J.

Detroit Letter

New Graham Cars

The list of passenger car producers has been expanded by one and possibly two entries. The one that is certain is Graham-Paige, which has not made cars for two years prior to the halt of all civilian production in February 1942.

While Joseph W. Frazer, chairman of the board of Graham, had announced his company would be back in the field of producers, it was believed that it would not be in the starting lineup this year but would probably bring out a car sometime in 1946. Frazer promised a new and different car which would embody many improvements.

But the announcement by the War Production Board of quotas beginning July 1st shows that Graham will start with the rest.

That the company is really serious about a much different car was the announcement that William B. Stout, pioneer inventor and designer, has been retained to direct postwar development at Graham. He will work with the company's engineers and designers and lend some of his long-range views on what the modern automobile should have.

Stout is under contract to Consolidated-Vultee in their research department. Although the department was recently moved to Nashville, Stout stayed behind. He is consultant on aviation research and is presently working on his "Skycar," which will be a combination of plane and automobile.

Stout, who has been about a decade ahead of his time on almost everything, will bring some ideas to Graham.

Small Company Quotas

Another possible new entrant into the automotive field is Diamond T. It has a small car which is now being made up here and if the costs can be worked out low enough to compete with Ford, Chevrolet and Plymouth, it may enter the field.

One of the significant parts of the announcement of the first quotas for car production is that 8,000 has been set as the minimum for any company to resume or go into production. It "permits any newcomers in the field" to operate at this starting rate, WPB said.

Also significant was the fact that while permitting some of the smaller companies to start at 8,000 units for 1945, a boost in the ceiling tentatively assigned to them, the first quarter of 1946 doesn't show the doubling of the 1945 rate which was programmed originally. For instance, Hudson is given 8,000 at the start and only 13,602 in the first quarter of 1946.

Similarly, Nash starts at 8,000 but goes up only to 11,500 in the next quarter. Willys will maintain the starting pace in the second quarter, as will Graham-Paige.

GM to Make 950,960

This indicates that while the minimum for the first year will be maintained at 32,000, none of the big producers will have to give up any of their quotas to help out the "little fellows." General Motors will make 95,096 in 1945, double it to 190,192 in the first quarter of 1946 and make a total of 950,960 in the first year.

Chrysler will make 49,635 this year, double that number in the first quarter of 1946 and make 496,350 in the first year. Ford will start with 39,910, double it in the next quarter and produce at least 399,100 the first year. Studebaker will start with 9,275, double it and go on to make 92,750. Hudson, however, will wind up the first year with 67,000 and Packard with 60,598. Nash's first year total has been set at 57,000.

Labor May Upset Plans

While all the quota setting is going on, problems are arising which may make them meaningless, unless straightened out now. One of the most bothersome is the inter-union rivalry for the construction work and installation of machinery in the plants. This broke into the open recently, causing stoppage of work on at least five plants in the Detroit area. One of the most important was the $2,500,000 addition to the Dodge Truck plant.

AFL unions insist that if they are to do the construction and maintenance work, they must also get all of the installation work. They have threatened to halt all work.

UAW Opposes AFL

The UAW insists that its members do the installation work and has notified the manufacturers they "will not tolerate" AFL workers on these jobs. Four hundred AFL workers were ordered from the Packard plant by UAW workers.

Walter Reuther, one of the UAW chiefs, said his union was willing to compromise the issue with AFL leaders but the latter have refused to meet with them. The controversy has been sent to Washington.

May Delay Reconversion

But this flareup may mean costly delay to reconversion plans while it is being ironed out. Each of the companies has been working feverishly for the July 1 "go signal." Competition, stilled by the war, is once again rife and will be from now on. Each company wants to get off to a head start with its 1946 models.

With unemployment mounting here by the day and 140,000 idle predicted in the area by September 1, the inter-union warfare may prove costly not only to the manufacturers but to the workers.

Ford's New Car—This new 8-cylinder Ford, hand-built, gave the public the first view of postwar cars

Agencies Offer Joint Tool Disposal Plan to Surplus Property Board

WASHINGTON—Progress in a program to shift government-owned surplus machine tools to industry for reconversion and civilian production was seen in a three-point transfer plan made to the Surplus Property Board by Army, Navy, and other procurement agencies jointly.

Deferred Payment

The joint proposal is that lessees of federally-owned tools have three choices: (1) purchase the equipment under the Clayton price formula; (2) purchase it on a deferred payment plan; (3) take it for use under a commercial lease for one year, with an extension clause.

It is believed the proposal basically represents the wishes of many war contractors, who outlined the plan to Army and Navy, which in turn sent it over to Surplus Property Board for checking against the law and the regulations.

The RFC, which is charged with surplus tool disposal, has 23 agencies throughout the country which, it is hoped, can dispose of the tools quickly. The government has agreed to get its tools out of privately-owned plants within 30 days after contract termination. In many cases, Defense Plant Corporation owns buildings contiguous with industry properties in which the equipment can be stored.

So far, of the estimated 700,000 machine tools owned by the government, only about 25,000 have been declared surplus, of which 10,000 have been sold. The Surplus Property Board figures that fully 25-35 percent of government tools come in some category completely useless to industry. Of these tools, many are also outmoded for military work. One example is rifling machines, which have been superseded by broaching machines, which are faster and cheaper. In addition, chrome plating of gun barrels makes them last two or three times as long, requiring less reboring.

More Arsenals Needed

What is ultimately done with standard machine tools owned by the government depends to some extent on postwar military policy. The War Department has six arsenals, some of its officers insist it "ought to have *thirty-six* instead." If the arsenal program is expanded, the requirement for machine tools of all kinds will increase. Practical political reasoning, however, indicates that all tools not needed in the war effort from now on, and all tools wanted for reconversion and civilian production after peace day, will be switched to industry on some terms or other.

Surplus Tools "Junk"

Tools declared surplus so far are described on high authority as "mostly junk." Some of them, however, have found interesting applications. Big boring mills, used in the production of tanks—finishing turrets mainly—have been taken gladly by some rail-rolling stock producers, for finishing wheel tires. The railroad equipment producers are in a bad way for equipment.

Senator Guy M. Gillette, retiring chairman of SPB, recently opposed pending changes before congress in the Surplus Property Law. He was testifying before the War Contracts Subcommittee of the Senate Military Affairs Committee. Proposed amendments and regulations would allow war contractors to acquire tools at reduced prices, and at the same time they could select the tools they want and reject others. Board members Lt. Col. Edward Heller and Robert A. Hurley testified in support of the proposed changes.

Magnesium Auto Wheels—Henry J. Kaiser (right) shows his guest R. J. Thomas, president, UAW, a new lightweight magnesium auto wheel. Kaiser interests have built an experimental lightweight auto with some parts made of magnesium, which has not been previously used in auto manufacture

Replacement Needs Held Major Postwar Hope for Tool Builders

CLEVELAND — Durable goods manufacturers will be confronted with three chief postwar obstacles in the opinion of F. H. Chapin, president, National Acme Company, as expressed in a Cleveland Trust Company booklet. Mr. Chapin stated these are: (1) wide government controls over business; (2) readjustment of the industrial economy; and (3) the difficulty of regaining normal markets. However, he pointed to the need for replacement of war-worn tools as a probable stimulus to postwar business for machine tool builders.

Mr. Chapin compared this situation with that of manufacturers of consumers durable goods, who are assured of favorable markets for an extended period. This major difference served to emphasize his plea for a sane and prompt disposal of surplus equipment.

New French Order

Machine tool builders were somewhat optimistic when the new $25,000,000 order for machine tools for France, to be supplied under lend-lease became known. There are indications that further European orders will soon be placed, thus taking up the slack among tool builders who held recently-cancelled contracts with Russia. Although some Soviet machines were transferred to France and Belgium, others in process of production have been removed from tool builders' production lines and shipped to warehouses, pending further instructions. Such action was logical unless plants were to be jammed with work-in-process.

Builders, dealers and users of machine tools are becoming increasingly concerned over the way the government is holding sales of surplus tools. Charges that the lists prepared for the benefit of purchasers are inaccurate and inadquate are being made openly here. Moreover, criticism is leveled, too, at the fact that lists are not available for prospective purchasers until a week before "spot sales," as occurred in the Springfield and Indianapolis sales recently. The consensus is that surpluses should be placed in the hands of experienced tool men.

Washington Bulletin

New Shop Book

"Establishing and Operating a Metal Working Shop" is the title of a 200-page book just released by the Department of Commerce for general distribution at 35 cents each. The book was prepared for War Department for educational work among service men. Commerce borrowed the type and halftones to print the book for civilians. It is assumed that readers will be mechanically experienced and therefore the text deals almost exclusively with management. Experience shows, says Commerce, that most business failures are due to lack of business know-how. Authors tell you how to select locations, all about capital investment, how to organize a business, how to plan buildings, how to go after business, and what *not* to do. By metal working shops the authors mean general repair and service shops, welding shops, sheet metal working, ornamental iron, combination shops, and mobile shops.

Postwar U. S. Navy

Navy is planning a postwar sea force in which the most modern ships would be placed in an "active" navy, while older and obsolescent ships would constitute a "reserve" navy which could be called into action if the international situation should require. The postwar Navy would be gauged to provide this country's share in a "concert of international force" and to "afford effective combat superiority" over the active naval forces of any other single power or any combination of likely enemies. Officials said the United States would not seek world naval superiority. The proposal was released by members of the Senate or House Committee on Naval Affairs.

Another Five Billions

Legislation has been introduced to raise the lending power of the Government's Export-Import Bank from about $700,000,000 to over five billion dollars. Washington in recent years has looked favorably upon liberal term loans to foreign countries to create new business for United States citizens. For example, the airlines in a given Latin American country might not appear capable of liquidating a loan for equipment. But if they had liberal terms they might use the equipment to earn its cost and build business that would call for still more. The Bank has an excellent record of collections, up to now, and seems likely to be given wider scope and backing. Export-Import is part of the Foreign Economic Administration, and it should be watched, along with the Government's lower tariff policy and general foreign trade program, for export opportunities.

Metals Competition

Availability of aluminum and magnesium in advance of steel for production of civilian goods: Washing machines, toasters, vacuum cleaners, fans, refrigerators, heaters and many other appliances, could be the starting gun for the often-predicted battle of the metals. Some officials here, concerned with metals, suggest that aluminum producers and fabricators will try to encourage a shift from steel. Problems to be encountered are high cost of the light metal, suitable equipment and the know-how to work it. Main point probably is that, in the long run, the public will pay more for aluminum products only where lighter weight is very important. Proposed shifts to aluminum and magnesium have included ships, bridges, building frames, automobiles, and whatnot, some of them by reputable engineers. If the present price of light metals proves too high, there is always the possibility of new processes bringing costs down. Everybody you talk to, even the expert in Government, is on one side or the other and trying to prove he's right.

German Stockpiles

Further indication that the Germans had supplies to carry on the war indefinitely is contained in a report from the U. S. Army in Europe, whose engineers are salvaging such Nazi war goods as prefabricated steel truss bridges, locomotives and box cars, trucks, automobiles, construction machinery, hand tools, batteries, generators, tractors, boats, several million tons of steel.

Officials in Washington were unable to tell the writer whether any of the goods would be sent to the Pacific, but they were of the opinion it would all be used in Allied operations in Europe, and in the rehabilitation of over-run countries.

Lt. Col. Charles C. Redman, commanding the salvage units, says that in 1941 this country had no such stockpiles as the Germans still had after their defeat. He reports that in one small area more than 4500 railway cars were loaded with 35,000 tons of materials. Vast quantities of cement and lumber are being recovered. I. G. Farben chemical works in the Saar, had lost 65% of its buildings by bombing, but only 30% of its machinery, and the plant now employs 4000 German workers producing supplies for the Allies.

The report shows that Army's target priority system worked: enemy transportation facilities, including production of gasoline for automotive and aviation, were knocked out, rendering supplies useless.

Light Plane Research

Suggestions that the National Advisory Committee for Aeronautics and Civil Aeronautics Administration be put to work on research development of light airplanes are increasing in frequency. NACA is almost wholly occupied with long-range air research for Army and Navy; CAA has only a handful of changes for airplane development. The time is at hand, and the demand will be great, for a personal airplane with near-automobile utility. But the needed design is not in sight. Light plane design stands practically where it was fifteen years ago.

Jap Suicide Pilot Bomb—On Okinawa's Yontan airfield, Marines are examining an abandoned Jap "Baka" bomb. The rocket propelled bomb is launched from a plane and is equipped with wings, fins and tail assembly. The pilot is locked into the cockpit for his suicide mission

Surplus Tools By Types Do Not Match Nation's Tools Over Ten Years Old

NEW YORK—An analysis of 58 percent of all government-owned machine tools indicates that this equipment will have a varying effect upon different tool builders, depending upon the types and numbers of tools declared surplus. This nullifies the practicability of scrapping the nation's 652,000 tools over 10 years old and replacing them with the 600,000 or so tools owned by the government. Although final data is yet to be compiled by the government on its 600,000 tools, AMERICAN MACHINIST has gathered the accompanying data on 350,000 of these tools to permit some important comparisons against the nation's tool totals, as indicated by AMERICAN MACHINIST's 1945 Inventory of Metal-working Equipment.

Tool Types Differ

These partial figures indicate that total government surplus holdings may be either substantially less or considerably more than the number of tools over ten years old in each major category. For example, the partial listing of government-owned honing and lapping machines, amounting to 5,097 are more than double the number of such machines over 10 years old throughout the country. On the other hand, the number of planers, shapers and slotters, keyseaters, and miscellaneous machines owned by the government, as indicated by these partial listings, is such a small fraction of the number of machines in the country over ten years old, that even if the figures are adjusted to approximate the total owned by the government, it is obvious that they will not cover the number of items over ten years old. This irregular pattern is probably further intensified if comparisons are made by sizes of the government-owned machines and sizes of machines over ten years old.

The accompanying table excludes certain holdings of the War Department, the Navy Department, and Defense Plant Corporation, and omits all of the Maritime Commission's listings. It might be noted that the omission of Navy Bureau of Ships and Maritime tools indicates that such excluded items would greatly increase the number of heavy tools owned by the government.

100,000 To Be Held

In considering the prospective surplus tool problem, it must be kept in mind that probably some 100,000 or so government tools will be retained by the Army, Navy, and DPC in arsenals and standby plants. Here again, the items retained will follow an irregular pattern according to different types of tools. Another consideration that will have a varying impact upon the different segments of the tool industry is that the Army and Navy may retain about one-fourth or more of their tool holdings whereas the bulk of DPC-owned tools will probably be declared surplus.

To get a close idea of the probable impact of surplus tools upon each segment of the tool industry, readers can adjust the government figures by increasing them by 40 percent to take in an approximate amount of the items omitted, and then deducting one-sixth from such totals to allow for probable government retentions for postwar reasons.

RELATIONSHIP OF 350,000 GOVERNMENT TOOLS TO NATIONAL TOTAL

MAJOR TOOL TYPES	PARTIAL LIST OF GOVERNMENT TOOLS			TOTAL TOOLS IN U. S., BOTH GOVERNMENT & PRIVATE OWNED	NUMBER OF TOOLS OVER 10 YEARS OLD
	ARMY & NAVY ORDNANCE (Z)	PRELIMINARY RFC LIST (X)	TOTAL LISTINGS		
Boring Mills	3,110	8,102	11,212	50,337	17,180
Broaching Mach	648	909	1,557	9,701	3,416
Drilling Mach	18,380	44,542	62,922	338,182	127,248
Gear-cutting & finishing	1,666	8,976	10,642	55,034	16,428
Grinding Mach	20,734	61,952	82,686	366,464	109,147
Lathes	30,355	48,405	78,760	418,501	169,581
Milling Machines	20,978	27,154	48,132	171,763	63,986
Planers	597	894	1,491	16,427	12,813
Shapers & Slotters	2,001	2,348	4,349	36,703	23,579
Keyseating	74	117	191	4,466	3,202
Honing & Lapping	1,048	4,049	5,097	16,134	2,119
Polishing & Buffg	2,429	8,802	11,231	57,384	23,574
Cut-off & Sawing (Y)	3,195	8,350	11,545	85,997	30,936
Rifling Mach	814	212	1,026	1,486	500
Tapping & Threadg	1,998	3,969	5,967	34,978	13,963
Centering Mach	311	325	636	3,458	1,894
Other Machines	3,118	9,931	13,049	44,122	32,619
TOTAL MACHINES	111,456	239,037	350,493	1,711,137	652,185

SOURCE: Official government reports and AMERICAN MACHINIST 1945 Inventory.

(X) Includes Rentra-lease and Pool Items. This data is based upon a preliminary RFC listing. (Y) Includes pipe-cutting and threading machines. (Z) Includes all Army Ordnance tools in ordnance plants and operated by private contractors, but only Navy Ordnance tools in government plants.

Spotting the Air News

Plane Program Doubts

If the Government has a plan or policy for termination of aircraft production contracts when Japan surrenders, nothing is known of it. A recent 30 percent cutback by Army Air Forces leaves all of the planes essential to the Pacific war in production, with no provision for a final stop order. Navy's aircraft program is planned through 1947, with no appreciable current reduction. The airplane manufacturers of course are concerned about this uncertainty, not only because their vast facilities and manpower would shut down with a chaotic jolt, but because they fear also that many or most development and research projects would be stopped along with the warplane orders.

Air Research Vital

Present wars have proved conclusively that three major elements are necessary to the creation of air power: (1) favorable public opinion; (2) an aircraft industry, in being and convertible, capable of producing superior numbers of units; and (3) research development capable of producing superior aircraft performance. The British first fended off the Luftwaffe with superior performance, and the Allies later beat the Germans and the Japs in the air with both quality and quantity. Aeronautical development is so completely nebulous that new jet and turbine engines will be obsolete on peace day. Even airplanes, as they are known now, may be completely out of future military operations. Guide missiles, some of them having no wings, and carrying fire, explosives, and gas, may largely displace conventional aircraft.

Sudden or Gradual End?

Not only aircraft manufacturers, but the Administration at Washington will be heavily involved in termination of war orders, especially in aircraft because of its vast scope. Dismissal of the bulk of aircraft personnel at one swoop would make an important employment and transport problem. As much as two years ago, some of the large airplane manufacturers, seeing victory ahead, were wondering whether the Government would decide to put a long taper on airplane production, after peace, to cushion the employment fall, or chop it off quick, to save costs and materials. Some of them thought that, though the products would be useless, it would be better for the country as a whole to cut down gradually. This controversy of course applies to many categories of war production.

Private Flying

For many years the industry has tried, with negligible success, to sell airplanes to executives for personal business use. Now the Government is leading the way. President Roosevelt started it with a special Douglas C-54 in which he flew to Yalta. President Truman is now using that plane. Additional C-54s, with special interior arrangements, are being built for Gen. Eisenhower, Secretary of Navy Forrestal, and probably other high officials. No doubt Government executive use of airplanes will continue after the war. Big drawback to executive flying is unreliability; storms hold them up for hours or days. But big government planes, with full flight instrumentation and skilled transport pilots, can perform better than 90 percent of any itinerary. Cost is a strong deterrent in business flying, and it will be in Government too.

Aviation Reconversion

Persons who believe that the Government will take airplane manufacturers by the hand and lead them back to peacetime status received a shock the other day when WPB decided that its aircraft division will soon be disbanded within three or four months. The industry has already been put on its own with release of most restrictions on production. Manufacturers are now free to produce civilian airplanes so long as there is no interference with war production. Manufacture of light airplanes are authorized by revocation of WPB order L-45, and airline planes, essential to war transportation, are given AA-2x priority assistance. When the Government settles contract terminations, removes its tools and other equipment from privately-owned plants, and sells to private owners such U. S. plants and equipment as they wish to buy, its job is done. Airplane manufacturers say that their cash reserves, under the war production program, are next to zero, and that they will have to fight for a public policy that will permit them to continue as an even comparably large industry. But apparently all agree that they are better off than before the war.

NACA Program Plans

The National Advisory Committee for Aeronautics, with three great laboratories at Langley, Virginia; Cleveland, Ohio; and Sunnyvale, California, is making a bid for public approval and Congressional support of its long-term basic research in aeronautics. Traditionally reticent about publicity and especially popular science, its director, Dr. George Lewis, and its chairman, Dr. Jerome C. Hunsaker, have managed for years without much benefit of the press. Result is that not one man in a thousand knows that NACA is one of the highest-ranking research organizations in the world, and that Army and Navy lean heavily upon it for the answers to many overall problems. Until recently, there was only the little Langley Field laboratory needing appropriations; now it takes millions to run the three big ones, and it takes educational work to get money from people, in peace time, for long-range, unglamorous, research. You will be hearing more about it from now on.

Tigercat For Marines—Marines will fly this new F6F Tigercat, to combat the improved performance of Jap aircraft. This Grumman fighter and fighter bomber is faster at sea level than any Jap plane. In high altitudes, it is in the 425-mile-per-hour class

Nation Headed For Labor Strife Due to Job Uncertainty

Fewer jobs, shorter hours, smaller take-home pay are causes for labor unrest. Wage boosts, legislation designed to head off big wave of strikes. Ball-Burton-Hatch Bill being studied

NEW YORK—Spreading strikes and labor unrest in recent weeks have been an ominous—but not expected—sign that the patriotic and shaky wartime truce between management and unions is nearing an end. Founded on the necessity of all-out production for victory, the truce has been weakened by munition cutbacks that have left labor uncertain of its future, little inclined to forego direct collective bargaining pressure.

Initial trouble in the auto and rubber industries, as well as stoppages in plants and vital services in many parts of the country, generally is regarded as only the foreshadow of events in the months ahead—particularly during the post-V-J Day period of mass reconversions.

Peace Plans Attempted

Concern over that critical period is behind efforts which have been made in Congress and out of it to draft a pattern for peaceful relations between labor and management.

In the current wave of strikes, labor—made restive by cutbacks which result in loss of jobs, shortened workweeks with elimination of overtime, and the downgrading of workers—is demonstrating its feeling of insecurity. Industry and government, it argues, have not done the necessary job of planning to take care of unemployed workers who may total, A.F.L. estimates, as many as 4,000,000 even during the Pacific war.

Strikes Come Easy

The feeling of insecurity on the part of the workers is responsible in large measure for their willingness to stop work on slight provocations. And despite their labor no-strike pledge, it has wiped out any hesitation over striking for such basic union issues as jurisdiction, maintained take-home pay, and the extension of wartime gains made in working conditions.

Doubt is growing that the no-strike pledge can survive the growing tension. A regional caucus of United Auto Workers (C.I.O.) local union leaders has demanded that the pledge be revoked, and has called for an industry-wide Connally-Smith strike vote. U.A.W.'s leaders, who urged that the no-strike pledge continue in effect at least in plants turning out materiel for the Pacific war, were rebuffed.

Legislation Status

Similar rank-and-file sentiment for more militant leadership already has appeared in some other C.I.O. unions. Resolutions have urged less attention to politics and international affairs, more of the John L. Lewis type of direct action which brought wage increases to miners.

New Secretary of Labor

L. B. Schwellenbach

To counteract this surging of sentiment for militancy, labor's leaders have intensified their pressure in Washington for wage increases. [C.I.O. has asked for quick passage of the emergency unemployment compensation program proposed by President Truman; immediate upward revision of wages; definite planning to speed reconversion, and establishment of industrial annual wage plans. A.F.L. asked for immediate restoration of collective bargaining within the present price structure—and an 11% boost in hourly pay rates now, to be obtained by collective bargaining, to recapture losses in the buying power of straight hourly wages.]

Ten Percent Wage Boost?

The demands laid before President Truman brought no commitment. The President let it be understood that the wage question was due for serious study after Judge Lewis B. Schwellenbach became Secretary of Labor on July 1.

The prospect in Washington is that a 10% increase is coming, partially because the administration believes such an increase is overdue, partially as a move to cushion the blow of reduced hours on the earnings of war workers. Likewise, the prospect is that the present 40c-an-hour minimum wage standard is due to go up at least to 50c.

Labor, for instance, wants a shortened workweek to spread jobs. Demands go down to as low as 30 hours of work a week. Industry is unwilling, and government is not amenable to a further slash at this time. Similarly, labor's guaranteed wage demands are making no headway.

Legislation Status

Labor's pet full employment bill, that sponsored by Sen. Murray and written as a guarantee that government will provide jobs for all employables who are not absorbed by private industry, has rather dark prospects at the moment.

So has another favored measure providing for a permanent Fair Employment Practice Committee.

While actually there have been few signs that industry will undertake any union-smashing campaign such as characterized the period after World War I, labor is on guard against the prospect. It is fighting in Washington against measures which might make possible such a campaign.

Ball-Burton-Hatch Bill

In the latter category is, labor feels, a bill proposed by Senators Ball, Burton, and Hatch. Announced this week, it would abolish the present National Labor Relations Board and substitute for it and existing conciliation machinery (1) an unfair labor practices tribunal which would function much as the NLRB does now, and (2) a labor relations board with broad powers over mediation, conciliation, and adjustment of labor disputes. Labor feels that present federal laws and agencies perform these duties adequately, and fear that revision would mean a new period of legal fights to interpret the new statute—just as ten years of activity has been necessary to clarify policies under the present act.

Even more, labor opposes—because it is suspicious of them—the bill's restrictions on work stoppages, closed shop contracts, and union activities.

So far, it does not regard the proposed bill as any more of a threat than a recent proposal by an arch foe—the National Association of Manufacturers—of a restrictive labor program. It knows, however, that with the National War Labor Board limited in life to the war period, some form of legislation is probable. The Ball, Hatch, Burton measure has the earmarks of a testing ground for serious legislation which will not appear, labor believes, until after Schwellenbach—working with President Truman—has had an opportunity to revamp the policies and personnel of the Labor Department.

Canadian Plane Producer Will Produce Prefabricated Homes

MONTREAL — One Canadian aircraft plant has at least a partial answer to reduced war production and, at the same time, can expect in some measure to solve an acute postwar civilian problem. The plan involves a switch-over from aircraft to houses.

Even before the war in Europe ended, directors of Fairchild Aircraft Limited, Montreal, were laying plans for assembly-line production of houses. To carry out the new program a subsidiary, Faircraft Industries, Ltd., was created. H. M. Passmore, president of the new company, announced recently that prefabricated houses, low-cost permanent structures of modern design produced at the rate of six a day, using an assembly line technique adapted from the automotive and aircraft industries, will be available to the public within a few months.

$3,300 F.O.B.

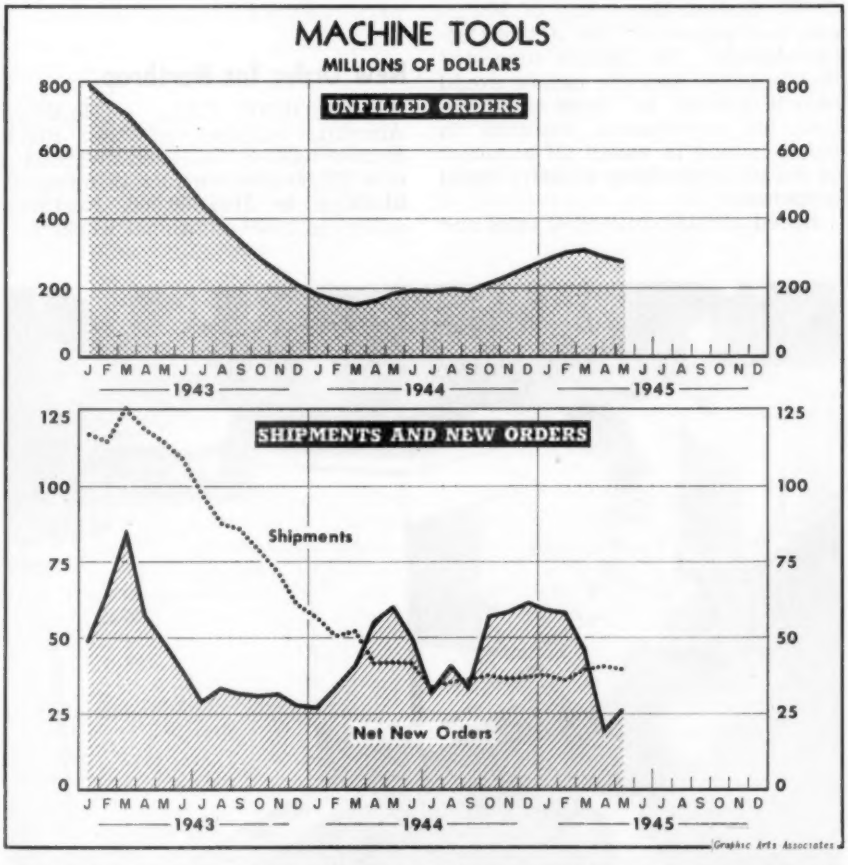
Construction of these houses, which will sell at $3,300 F.O.B. factory on National Housing Act conditions, has been authorized by C. D. Howe, Minister of Reconstruction. They will be turned out at the aircraft plant at Longueuil, near Montreal, which has been turning out Curtiss Hell Divers for the U. S. Navy until recently.

Said to be as revolutionary in its implications as the original conception of the first low-cost automobile, the new Faircraft Home is a four-room, single-story cottage, 25′ x 30′, insulated to stand the rigors of the Canadian winter, and supplied complete with electrical and plumbing fixtures which need only to be connected on the site.

Ready in Few Hours

The houses can be made ready for occupancy in a few hours. Plumbing is installed and tested before the house leaves the factory. All electrical fixtures are tested, also. All painting both interior and exterior is completed, and linoleum is laid on the floors. Besides being modern and attractive, the house can be added to as the family grows. Expense of heating and maintenance is said to be low.

Delivered to the foundation site by truck, the Faircraft Home can be quickly assembled, and the only work remaining is the connection of water, sewage and electrical services. Faircraft engineers are experimenting with aluminum as the exterior covering, in view of the shortage of first-class lumber.



Declining Backlog—The industry's backlog slipped to $275,256,000 at the end of May from April's $287,920,000, as a result of declining new orders and continued heavy cancellations. Only part of the Russian cancellations are reflected in May's $16,437,000 cancellations, down from April's $26,362,000. New orders at $42,635,000 were slightly above shipments of $39,825,000. Both new orders and shipments were below April.

Aviation Conference Features Jet Propulsion, Gas Turbines

LOS ANGELES — In cooperation with the University of California, the Southern California Section of the American Society of Mechanical Engineers conducted an Aviation War Conference here, on the University's local campus, June 11 to 14.

Because of wartime restrictions, attendance was largely local, despite which the meetings, held in the evenings and open to the general public, drew excellent crowds, mostly from the local aircraft industry.

The opening session, on Monday evening, after an opening address by Dr. Clarence A. Dykstra, Provost of the University, was devoted to gas turbines and jet propulsion. M. J. Zucrow, Executive Engineer, Aerojet Engineering Corp., Azusa, Calif., spoke on "Jet Propulsion Principles and Rockets for Assisted Take-off." Colonel Homer Boushey, Commanding Officer, 412th Fighter Group, Army Air Field, Bakersfield, Calif., spoke on "Jet Propelled Airplanes." Films were used to illustrate both speeches.

Broad Discussions

Fifteen parallel sessions were held on the three subsequent evenings, five sessions each evening. One or more sessions was devoted to each of the following subjects; heat transfer, standards and quality control, rubber and plastics, instruments and regulators, applied mechanics, management, production, metals engineering, hydraulics, and power plants.

Apart from the emphasis on jet propulsion and gas turbines, several sessions being devoted to this subject, interest and discussion centered generally on refinements and improvements, both in engineering design and production and management subjects.

The meeting indicated that the industry's postwar thinking includes almost as much attention to the general organizational and management problems that the aviation industry will face when it shrinks to its postwar size.

New Contractors' Guide

NEW YORK—A new Army-Navy Contractors Guide has been issued. Copies may be obtained without charge by written request to the Readjustment Distribution Center, 90 Church Street, New York 7, N. Y.

Bryant Asks Government to Keep Half of Its Tools at ASME Meeting

CHICAGO—Retention by the government of at least 50 percent of the total machines it owns at present was advocated by A. G. Bryant, vice president, Cleereman Machine Tool Company, and president, Bryant Machinery & Engineering Company, in a talk before the Chicago Section of the American Society of Mechanical Engineers on June 19, 1945. He pointed out that "Machine tools are a first essential in any nation's defense program—and there is no assurance that a potential enemy of this country would give us two years' time in which to accomplish the production miracle necessary to prepare for all-out defense."

Advantages of Surplus

Mr. Bryant pointed out that the surplus of machine tools and other equipment, while staggering in its potential effect upon the industries involved, may, under a sound public policy, be this country's most potent instrument for building economic prosperity and for maintaining international peace. Pending the re-education of large sections of the world's population as to the meaning of peace, no influence can be more potent in restraining some future gangster nation than the knowledge that this country has thousands of machines ready for immediate use and capable of turning out the last word in defense material.

Program Proposed

Bryant also reminded his listeners that modern machine tools are economic necessities. If with our master machine tools our labor can produce more, quicker and better, our nation can compete in future world markets, and we can further raise our standard of living. If we can eliminate from American industry the thousands of broken down jalopies of machines and substitute in their place modern tools, we would greatly improve the economic and industrial strength of the nation. He suggested that we can do this by (1) creating an agreeable but stimulating climate in which business will want to invest in new equipment and will be justified in venturing capital with some hope of financial return; (2) by revising our rates of depreciation on capital goods allowed by the Bureau of Internal Revenue, so that business may not be required to amortize machine tools over an average of more than twenty years; and (3) by an aggressive, fearless and intelligent policy of surplus distribution.

The two-day conference of the Chicago Section of A.S.M.E. held at the Hotel Stevens on June 18-19, substituted for the regular semi-annual meeting of the society, cancelled due to travel restrictions. It was opened with a talk by Dr. Shoults, vice president, Bell Aircraft Corporation, on "Airplanes of the future and the future of the airplane." He discussed limitations of propeller-driven aircraft powered with reciprocating engines or turbines, as well as, possibilities and limitations of planes powered with jet-propulsion units. He showed motion pictures on the Bell Helicopter to indicate one of the fields in which further development may be expected.

Art of Management

The management Session commemorated the 50th Anniversary of Frederick W. Taylor's paper, "A Piece-rate System," in which Mr. Taylor first discussed his now famous paper of scientific management. His achievements were reviewed by W. R. Williamson, consulting engineer, in a paper "The Art of Management," and by Prof. O. W. Boston, University of Michigan, in a paper on "The Art of Cutting Metals." Mr. Boston suggested that industry and the nation would benefit greatly by some organization for coordinated research in metal-cutting in which all branches of the metal-working industry could cooperate.

Speed carbide milling of steel and cast iron was discussed in papers presented at the metal-cutting and production engineering sessions. These included papers by Lt. Col. E. G. Moffat, works manager, Watervliet Arsenal; M. F. Judkins, chief engineer, Firthite Division, Firth-Sterling Steel Co.; A. William Meyer and Frank Archibald of Brown & Sharpe Manufacturing Co.; W. E. Bullock and Michael Field of the University of Cincinnati; J. B. Armitage and A. O. Schmidt of the Kearney & Trecker Corp.; and Professors O. W. Boston and W. W. Gilbert of the department of metal processing, University of Michigan.

Steel Machinability

"Studies on machinability of carbon and alloy steels" was the subject of a paper presented by G. P. Witteman, assistant metallurgical engineer, Bethlehem Steel Company. His discussion covered studies made of the machinability of cold-finished steel bars in automatic screw machines. H. Whittaker of the Koebel Diamond Tool Company presented a paper on "Substitution of Lower Quality Industrial Diamonds in Diamond Dresser Tools," in which the results of studies recently made were reported.

New Order for Northrop

HAWTHORNE, CAL. — Northrop Aircraft, builders of the *Black Widow* fighters has been awarded a new $25,000,000 contract, bringing its blacklog to $146,000,000. Northrop will need 2,000 additional workers.

Reconversion Beginnings—These gas cooking stoves are among the first civilian items to start rolling off the assembly line. Manufacture has been resumed at the Detroit-Michigan Stove Company's plant

Names in the News

Elmer J. Steger

A. N. Goddard

Elmer J. Steger, manager of the pneumatic tool and appliances division of The Cleveland Pneumatic Tool Co., Cleveland, Ohio, has been appointed manager of the company's Cleveland Rock Drill division. Mr. Steger is executive vice-president and treasurer of the company's Canadian subsidiary, Cleveland Pneumatic Tool Co. of Canada, Ltd. Albert H. Hruby, recently in charge of contract termination, becomes sales manager of the rock drill division.

A. N. Goddard, president of the Goddard and Goddard Co., Detroit, Mich., was awarded the honorary degree of Doctor of Engineering at Wayne University, Detroit, Mich., commencement exercises in June.

Nelson C. Dezendorf has been appointed director of sales of the electro-motive division, LaGrange, Ill., of General Motors Corp., New York. He has been serving as director of the distribution staff of General Motors.

Byrom Judson Smith, former production executive with the Lycoming Division of The Aviation Corp., Stamford, Conn., has been appointed chief production engineer of Pitney-Bowes Postage Meter Co., in Stamford.

John W. Craig has been named general works manager of the Richmond, Indiana, plant of The Crosley Corp., Cincinnati, Ohio.

F. W. Duggan has been appointed sales manager of the Deepfreeze Division, Motor Products Corp., North Chicago, Ill.

F. L. Burke, W. G. Lewellen and **Frank R. Pierce** have been elected vice presidents of General Motors Corp., New York.

George H. Dowding has been promoted to director of industrial relations of the Carnegie-Illinois Steel Corp., Chicago district, succeeding **Peter V. Martin,** who leaves the U. S. Steel subsidiary company for assignment abroad with the Foreign Economic Control Council.

Recently elected officers of the Tool Manufacturers Assoc., Dayton, Ohio, are: **A. J. Burgmeier,** City Engineering Co., president; **H. C. Moore,** Moore-Eastwood Co., vice president; **George J. Capliski,** Eureka Tool and Die Co., treasurer, and **H. L. Neilson,** who continues as secretary.

Roy I. MacArthur, formerly assistant superintendent of the Buick forge plant, General Motors Corp., Flint, Mich., has been promoted to the position of superintendent.

C. Roy Anderson has been appointed works manager of Johnson Gage Co., Bloomfield, Conn. Formerly he was assistant superintendent of the gage department, Pratt & Whitney Division, Niles-Bement-Pond Co.

Armin G. Kessler has been appointed manager of sales of the midwestern district of the Farrel-Birmingham Co., Inc., Ansonia, Conn., with headquarters in Akron, Ohio.

Paul Mueller, formerly chief engineer of Blaw-Knox Co., Pittsburgh, Pa., will assume a new post with Pratt & Whitney, Hartford, Conn., this month as manager of engineering and research.

Kenneth MacGrath, formerly executive vice president of Air Associates, Inc., has been elected president of the corporation effective August 1st, succeeding **Harold I. Crow,** who has resigned as of that date.

George S. Garrard has been appointed chief engineer of the Briggs Clarifier Co., of Washington, D. C. and Bethesda, Md. He has been associated with the Jacobs Aircraft Engine Co., of Pottstown, Penn.

Frederick W. Rohde, known as the first American to attempt a transatlantic flight from Europe to America, has been appointed manager of Quality Control at Westinghouse Electric Corp.'s Aviation Gas Turbine Division in South Philadelphia, Penn.

Robert Hirsch has been made vice president in charge of sales at The Bunting Brass and Bronze Co., of Toledo, Ohio. He has been serving in the capacity of sales director.

Forest W. King has been appointed works manager at the Warren City Manufacturing Co., Warren, Ohio.

W. F. Boyle has been appointed assistant to the vice president to direct the Pacific coast district office of the Baldwin Locomotive Works, Philadelphia, Pa., and the Pelton Water Wheel Co., subsidiary.

A. F. McGraw, until recently general sales manager of the Allis-Chalmers tractor division, Milwaukee, Wis., has been named director of sales of Food Machinery Corp., San Jose, Calif.

Ernest C. Brelsford, until recently assistant treasurer of the Weston Electrical Instrument Corp., Newark, N. J., has joined Thompson Products, Inc., Cleveland, Ohio, as assistant to **J. H. Coolidge,** vice president and treasurer.

C. B. McLaughlin

P. M. Magruder

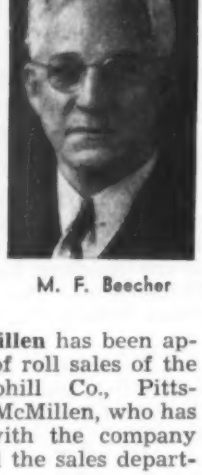
Carl B. McLaughlin will head up the recently established engineering division of Tube Turns, Inc., Louisville, Ky. He was formerly associated with Tube Turns' Pittsburgh, Pa., office.

Peyton M. Magruder has been appointed director of commercial sales of The Glenn L. Martin Co., Baltimore, Md. **John H. Humpstone** has been named assistant in charge of export sales. Mr. Magruder will direct activities of both domestic and foreign sales as well as those of non-aeronautical products.

George A. Collier has been appointed general sales manager of the Lees-Bradner Co., Cleveland, Ohio. Mr. Collier was formerly in charge of sales of the Cleveland Automatic Machine Co.

C. L. Koehler has joined the Schaible Co., Cincinnati, Ohio, as works manager. He has been associated with the Alvey Ferguson Co., Cincinnati, for the past 26 years.

W. J. McMillen



M. F. Beecher

William J. McMillen has been appointed manager of roll sales of the Mackintosh - Hemphill Co., Pittsburgh, Penn. Mr. McMillen, who has been associated with the company since 1916, entered the sales department in 1927.

Milton F. Beecher, director of research for the Norton Co., Worcester, Mass., was awarded an honorary degree of Doctor of Engineering by Iowa State College, from which college he was graduated in 1910. Mr. Beecher is author of nine publications in the field of ceramics. In 1944 he was elected president of the Institute of Ceramic Engineers.

Tom Girdler, chairman of the board of Republic Steel Corp., Cleveland, Ohio, **R. I. Ingalls, Jr.,** president of Ingalls Iron Works, Birmingham, Ala., and **Charles J. Haines,** president of the National Cylinder Gas Co., Chicago, Ill., have all been added to the seven man board of directors of the Girdler Corp., Louisville, Ky.

Henri Benedictus, president of the Etablissements Henri Benedictus in Brussels, who has been residing in this country for the past few years, has been appointed by the Belgian Government as a member of the Belgian Machine Tool Mission, which at present is active in Washington, D. C.

Tom C. Clark

Tom C. Clark, former Assistant Attorney General, has been appointed Attorney General by President Truman to succeed Attorney General Biddle, resigned. Mr. Clark has been with the Justice Department since 1937, and has held various important posts including those of head of its Anti-trust Division and chief of its Criminal Division.

Avery C. Adams of the United States Steel Corp., of Delaware is resigning as vice president-sales. **David F. Austin,** vice president in charge of sales of Carnegie-Illinois Steel Corp., has been appointed acting vice president-sales to replace Mr. Adams.

BUSINESS ITEMS

Continental Can Co., Inc., New York, has moved its Philadelphia, Pa., district sales office from 15th and Walnut streets to 12 South 12th Street.

Carl A. Backer, for the past four years factory manager for the **Cameron Iron Works** of Houston, Texas, has opened offices at 617 Chronicle Building, Houston, as a manufacturer's representative for **Michigan Tool Co., Colonial Broach Co., Detroit Tap & Tool Co., Colonial Bushings, Inc., Tungsten Carbide Tool Co.,** all of Detroit, Mich., and the **Genesee Tool Co.,** of Fenton, Mich.

Reynolds Metals Co., Louisville, Ky., is planning to expand two of its Louisville plants at a cost of around $3 million.

Kingsbury Machine Tool Corp., Keene, N. H., has been admitted to membership in the **Gray Iron Founders' Society,** national association of manufacturers of engineering gray irons with headquarters in Cleveland, Ohio, and Washington, D. C.

The Wire Recorder Development Corp., Chicago, Ill., has moved into larger offices in the Field Building, 135 South LaSalle St. from 8 South Michigan Ave.

Hesse-Ersted Iron Works, Portland, Oregon, has changed its name to **Western Machinery Corp. Gregoire E. Haefliger** is the newly elected vice-president and general manager.

Grinders & Fixtures, Inc., Cleveland, Ohio, has acquired from the **Cleveland Tool Engineering Co.,** all manufacturing rights to that company's two principal products.

F. L. Jacobs Co., Detroit, Mich., have plans for the construction of a new plant in Danville, Ill.

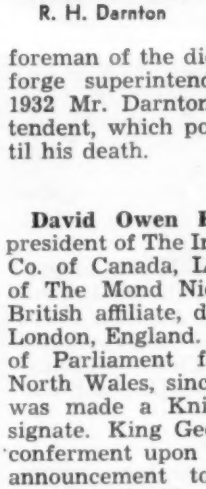
Harron, Rickard & McCone Co., of Northern California has purchased the assets and taken over the lease on the building of its predecessor, **Harron, Rickard & McCone Co.,** at 2070 Bryant St., San Francisco, Cal.

Genesee Tool Co., Fenton, Mich., has established an office at 8855 Woodward Ave., Detroit, Mich.

Blaw-Knox Co., Pittsburgh, Pa., has purchased the **Buffalo Foundry & Machine Co.** of Buffalo, N. Y. It will be known as the Buflovak Division of the Blaw-Knox Co.

OBITUARIES

Alfred E. Alber, 58, died June 2 at his home in Cleveland, Ohio. One of the city's expert gage-makers and a veteran employee of Tools and Gages, Inc., Cleveland, Mr. Alber worked for the United States government in both World Wars and had worked in Cleveland for a period of 40 years.



R. H. Darnton

Robert H. Darnton, 62, of Flint, Mich., died at his home on May 27 following an illness of several weeks. For the past 15 years he had served as superintendent of the Buick Forge plant in Flint. He came to the plant in 1912 as a die sinker, became general foreman of the die shop in 1918 and forge superintendent in 1921. In 1932 Mr. Darnton became superintendent, which position he held until his death.

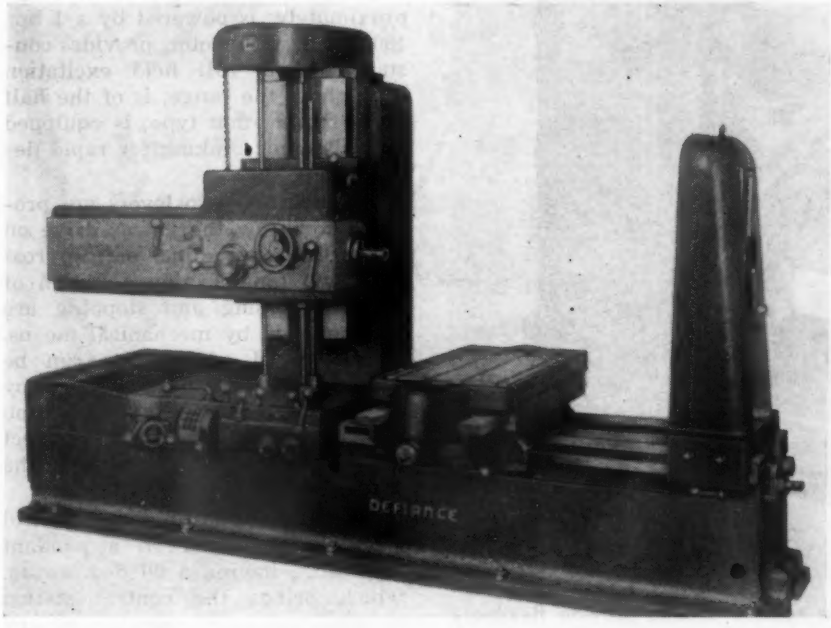
David Owen Evans, 69, a vice president of The International Nickel Co. of Canada, Ltd., and chairman of The Mond Nickel Co., Ltd., its British affiliate, died on June 11 in London, England. A liberal member of Parliament for Cardiganshire, North Wales, since 1932, Mr. Evans was made a Knight Bachelor Designate. King George approved the conferment upon Mr. Evans and an announcement to this effect appeared in the Honours List published on June 7.

MEETINGS

A special conference of all Armour Magnetic Wire Sound Recorder licensees July 13, Book-Cadillac Hotel, Detroit, Michigan.

Shop Equipment News

Defiance Horizontal Boring Mill Provides Flexibility in Operation



Horizontal boring mill by Defiance provides accessible locations for operating controls. Main spindle is full counter balanced

A 2½ in. horizontal boring, milling, drilling and tapping machine, model No. 22, is announced by Defiance Machine Works, Inc., Defiance, Ohio. This machine is intended to meet requirements of machine tool users where intensive production and precision work is required. It is especially suited to the needs of toolrooms for small jig and die work.

The speed and feed mechanism and the spindle housing are of unit construction. Infinitely variable speeds from 25 to 1600 r.p.m. in either direction on the main spindle are provided with this machine to give a full range of speeds with one spindle. It has a direct reading indicator for spindle speeds, and direct reading feed chart. Spindle and sleeve bushings are made of Nitralloy. It is equipped with a brake to stop the spindle.

The machine has 18 feeds in geometrical progression, ranging from 0.002 to 0.125 in. per revolution of spindle. Five feeds are standard tapping leads.

Its construction is designed to insure rigidity, strength and accuracy. Column ways are 5 × 1½ in. and 18 in. across. Bed ways are 5 × 1½ in. and 24 in. acrosss Table ways are 4 × 1½ in. and 21 in. across. Table has the working surface of its entire area provided with T slots and cross slots. The backrest boring bar support has one vee way and one flat way. Saddle is guided on inside of bed ways.

The spindle head unit has been given a substantial bearing on the column and is counter-balanced to relieve the elevating screw of undue strain. The actuating screw is located in the center of the column ways between a dovetail guiding edge and a tapered take up gib which is on the inside edges of the column ways. Clearance is allowed on rear edge of slide and the front edge is provided with a binder. This arrangement brings the guiding edge, as well as the clamping surfaces, close to the spindle nose and the work, which effects a rigid support for the cutting tools. All the gears, shafts, and clutches are made of high grade alloy steel. All helical drive gears are balanced and shaved. All bearings are automatically lubricated by means of a pump mounted inside the head. Control levers are conveniently located for the operator.

Directly above the spindle a 3 in. over-arm can be pulled out and a high speed milling or drilling unit can be mounted for vertical work.

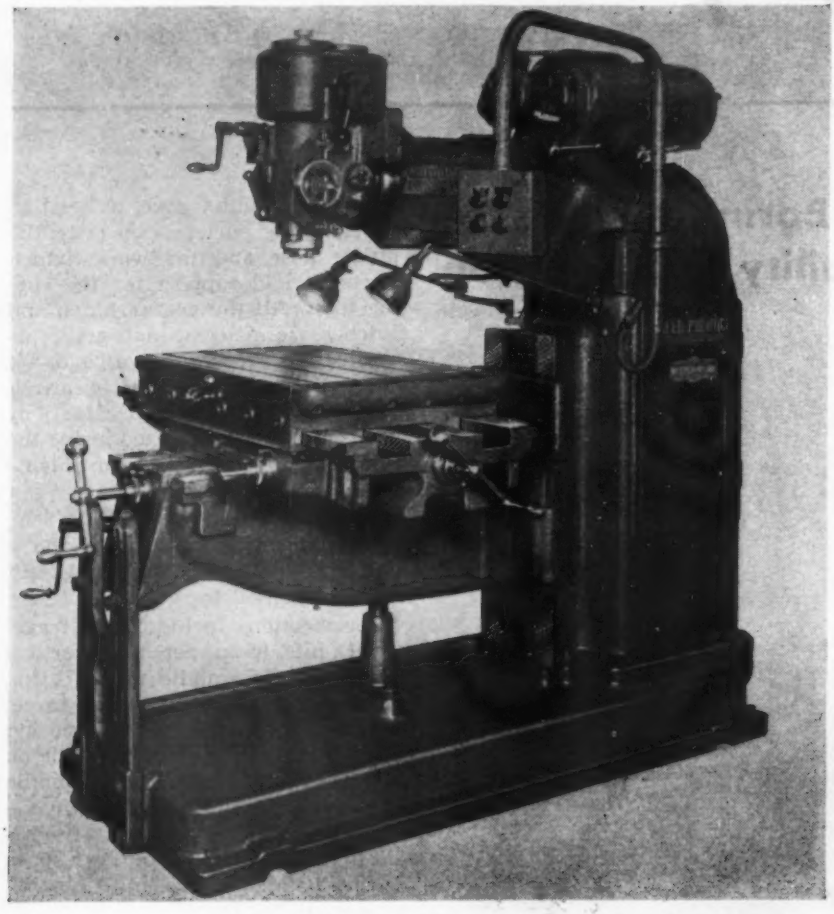
Specifications include: fast travel to all units, 95 in. per min.; vertical adjustment of spindle head, 24 in.; table size, 24 × 36 in.; cross travel of table with automatic stop, 36 in.; longitudinal adjustment of saddle on bed, 34 in.; distance between spindle sleeve and bar support, 60 in.; maximum distance from center of spindle to top of table, 24 in.; floor space occupied, 105 × 155 in.; shipping weight, 19,800 lb.

Accessories include: precision thread cutting attachment for English or metric threads; coolant equipment; dial indicators and end measures for head and table movements; verniers for head and table movements; vertical milling attachment; 30 × 30 in. built-in swivel table with power feed; 24 × 24 in. auxiliary swivel table with power feed; 24 × 24 in. auxiliary swivel table with hand feed.

Alexite Develops Fireproof Absorbent for Spilled Liquids

A highly absorbent mineral manufactured by Alexite Engineering Co., Colorado Springs, Col., is used where liquid spillages occur. It is used on surfaces where oil, grease, water, syrup, chemicals, or any liquid is spilled. It is also used for acid absorption. It does not become slippery when saturated. Super-Absorbit will absorb 392.8 per cent of its weight in water and 315.62 per cent in oil. It is fireproof, dielectric, light in weight and contains a minimum amount of abrasive.

Reed-Prentice Miller Provides Electronic Feeds for Die-Sinking



Electronic controls and infinitely variable spindle speeds provide flexibility in the Reed-Prentice miller for toolroom operations

The Reed-Prentice No. 22V vertical milling machine manufactured by Reed-Prentice Corp., Worcester 4, Mass., is a heavy duty, knee-type unit designed for toolroom and die sinking work.

The spindle head has a tilting arrangement which allows milling at all angles within 45 deg. front and back within 30 deg. left and right of vertical. Head and transmission are mounted on a sliding ram to increase operating range.

The spindle is driven by a 3 hp., 1800 r.p.m., a.c. motor. Although this is a constant speed motor, infinitely variable spindle speeds are obtainable between 90 and 2200 r.p.m. by means of a Reeves drive. This drive is push-button remote-controlled, and thus the operator has finger-tip control over the spindle speed and is able to make speed adjustments while the cutter is in action. Spindle speed indicator, graduated in r.p.m., is mounted on transmission.

An auxiliary high speed drilling head is available with spindle speeds from 410 to 6450 r.p.m., driven by ½ hp., a.c. motor. The high speed head may be installed without removing standard head by swiveling it from right hand to left hand side of ram.

Table and saddle are mounted on rollers operating on hardened steel ways, allowing for effortless hand operation with heavy table loads. Cross, vertical and longitudinal feed screws are equipped with micrometer dials graduated in thousandths.

The table has a working surface of 32 × 22 in. and is 4 in. thick. Vertical feed of knee is hand operated and has 16 in. travel. Longitudinal and cross feeds have range of 27 in. and 20 in. respectively and are power driven by one variable speed electronic unit.

The electronic feed drive provides a feed range from less than ½ in. to over 40 in. per min. which corresponds to a ratio of 80 to 1 approximately; is powered by a 1 hp., 1800 r.p.m., d.c. motor; provides constant torque, full field excitation throughout the range; is of the half wave rectification type; is equipped with dynamic braking for rapid deceleration.

A clutch and two levers are provided to throw the power drive on either the longitudinal or the cross feed, and for selecting direction of feed. Reversing and stopping are accomplished by mechanical means.

Feed speed adjustments can be made while machine is feeding by just moving the potentiometer knob and so the operator is able to select the most efficient feed rate when the cutter is operating.

Centralized pushbutton control station is mounted on a pendant rigid arm, having a 90 deg. swing, which brings the control station in easy reach of operator in any working position. All the controlling means are mounted on this station; namely, "spindle start" and "stop," "spindle faster" and "slower" pushbuttons, "power on" and "off" switch which energizes to electronic unit, "feed start" and "stop" switch, and feed speed potentiometer.

The magnetic control panel and the electronic unit are mounted inside the column in dust-tight compartments.

SPECIFICATIONS OF THE REED-PRENTICE 22V VERTICAL MILLING MACHINE

Longitudinal feed (hand or "electronic" power)	27 in.
Cross feed (hand or "electronic" power)	20 in.
Vertical feed of knee (hand)	16 in.
Horizontal ram adjustment (hand)	16 in.
Table: length by width by thickness	32 x 22 x 4 in.
Spindle speeds (infinitely variable)	90—200 r.p.m.
Vertical travel of spindle	5 in.
Taper hole in spindle NMTBA	No. 40
Throat depth, with ram fully extended	30 in.
Electronic power cross or longitudinal feeds	½-40 in. per min.
Weight: with power feed	6,750 lb.
without power feed	6,500 lb.

LODGE & SHIPLEY LATHES AT WORK!

Wholly Satisfactory

FOR ROUGH AND FINISH TURNING

Long Shaft Jobs

AT

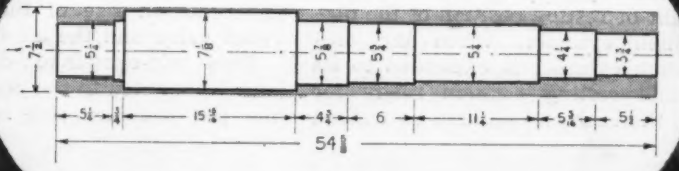
CINCINNATI PLANER CO.

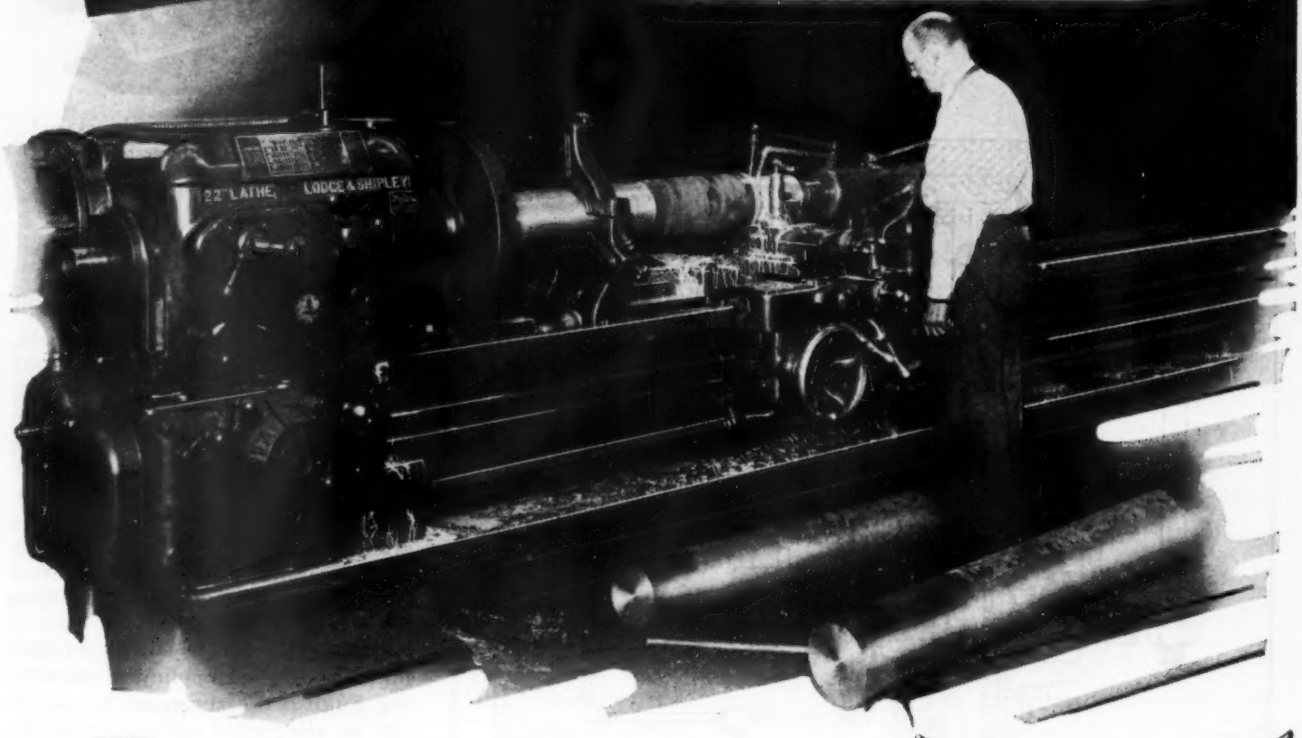
● If anyone knows the many advantages of an up-to-date machine tool—it's a machine tool maker! To make finer planers, vertical boring mills and planer-type millers, The Cincinnati Planer Co. uses new and better machine tools . . . like this new Lodge & Shipley 22″ Lathe.

The illustration shows this L & S Lathe rough turning a shaft for the table driving gear train of a vertical boring mill. Using a high speed steel tool, the shaft is turned from a 7½″ diameter bar of hot rolled SAE 4145 Steel, 54⅝″ long.

Completely new from the bed on through to the tail-stock and head stock, this lathe in the words of The Cincinnati Planer Co., "combines accuracy, rigidity and convenience . . . is wholly satisfactory for turning the longer shaft jobs used in our line of machine tools."

Write for detailed literature No. 606 and 622. For first hand information call on L & S Engineers.





THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

ENGINE — TOOL ROOM — AUTOMATIC — OIL COUNTRY LATHES

L & S LATHES

Dayton-Rogers Die Cushion Boosts Available Press Pad Pressures

When draw-ring holding pressure in excess of the available shop air line pressure is wanted, the self-contained hydro-pneumatic die cushion manufactured by Dayton-Rogers, Minneapolis 7, Minn., can be used. Through the use of hydraulic principles, it is possible to get ring holding pressures on the hydro-pneumatic cylinder up to 400 lb. per sq. in. from an 80 lb. per sq. in. air line. The operation of this cushion is as follows:

By applying regulated air pressure against the oil in a surge reservoir from a regulating valve, the oil is pushed through a check valve into the die-cushion cylinder, thereby maintaining the predetermined height or resting position of the die-cushion cylinder. When the die-cushion cylinder is expanded to its normal resting position ready for use, the cushion cylinder, as well as part of the surge reservoir, is filled with oil and held in suspension by the hydraulic check valve.

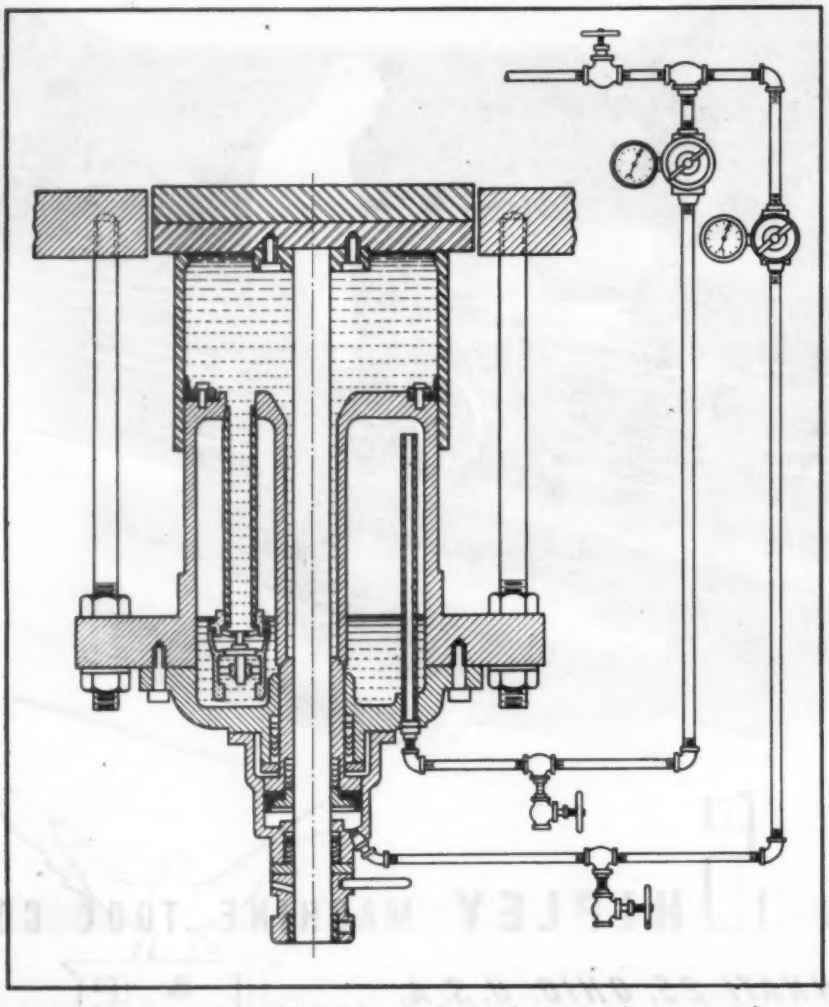
A given pressure is maintained on the hydraulic relief valve by increasing or decreasing the applied air pressure in the air cylinder controlled by the combination reducing-regulating valve. On the up cycle of the die cushion, the relief valve remains closed and the check valve is open, allowing the fluid to return into the pneumatic die-cushion cylinder, bringing it back to its original resting position.

The ring holding pressure developed by the cushion cylinder is dependent on the air pressure applied against the air cylinder and the difference in size of the hydraulic relief valve and the air cylinder.

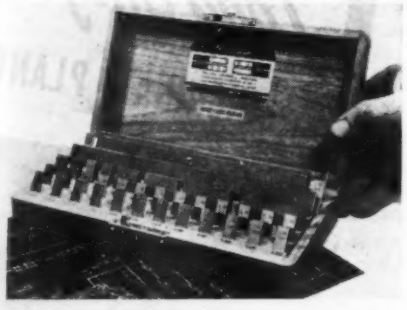
This self-contained die cushion unit is mounted to the press bed and the pin pressure pad is in direct contact with the bottom side of the bolster plate. The handwheel adjustment makes it possible to stop the pin pressure pad at a predetermined position below the bottom side of the bolster plate when required. This not only compensates for variation in bolster plate thicknesses but also simplifies positioning of the draw ring relative to the dies used at all times.

The hydro-pneumatic die cushions are especially adapted for high ring holding pressure, particularly in the drawing of thin stainless steel and other thin stocks when the wrinkling of such material is excessive.

The overall height of this cushion is held to a minimum, making it possible quickly to install it on any punch press without the necessity of providing for a pit.



Air line pressures are multiplied by the hydraulic accumulator principle employed in the Dayton-Rogers hydro-pneumatic cushion



The DoALL metric gage block set eliminates English conversions when working to metric standards

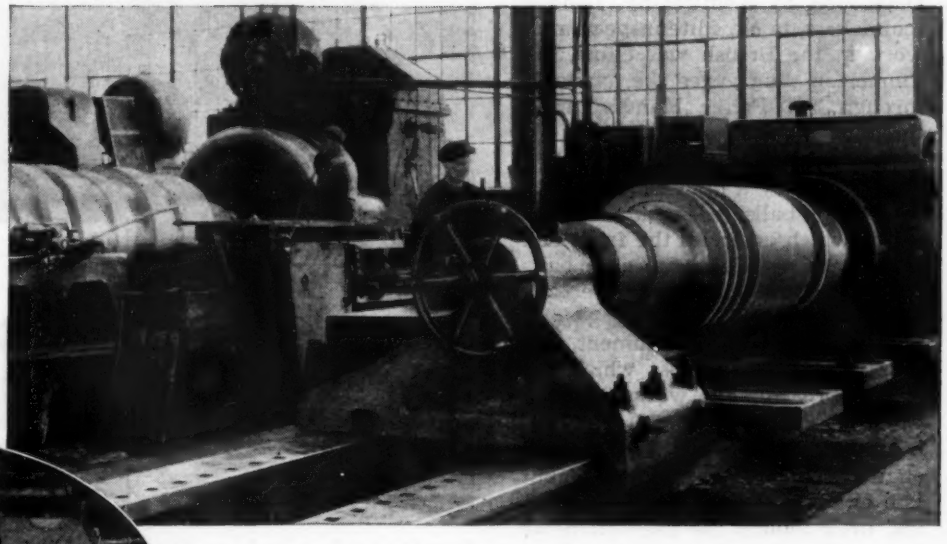
DoALL Metric Gage Blocks Simplify Use of Metric System

The makers of DoALL products, Continental Machines Inc., 1301 Washington Av., Minneapolis 4, Minn., announce a series of metric gage blocks designed to fill the needs of domestic and foreign manufacturers working in the metric system.

These blocks are offered in two grades that correspond in accuracy with the English system. Inspection quality guaranteed accurate within ±0.0001 mm. and working quality guaranteed accurate within ±0.0002 mm. The standard policy of converting English measurement to metric can be eliminated entirely with the range of measuring combinations possible. Calibrated in the metric system, the blocks can also be used to make up English system combinations.

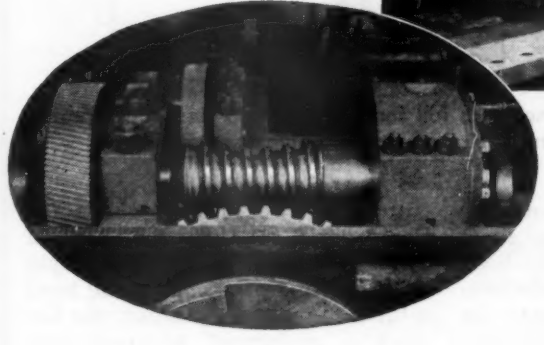
The set consists of 38 blocks plus 2 wear blocks (of tungsten carbide in the inspection grade) and is capable of producing over 100,000 combinations ranging from 1.01 mm. to

CONE-DRIVES "SELL" MACHINE TOOLS



RIGHT: New United CONE-DRIVE geared Roll Lathe. Note size comparison with former lathe at left of photo.

BELOW: Note compactness of United's new headstock—due to Cone-Drive gearing.



That's what United Engineering and Foundry Company found, not only when it adopted CONE-DRIVES for rolling mill screw-downs, but again when it re-designed its heavy duty roll lathes using CONE-DRIVE geared headstocks. The first three delivered sold eight duplicates.

According to United, in addition to the vastly higher load carrying capacity of CONE-DRIVES, this gearing accomplished "perfectly steady or uniform surface speed when cutting". Greater compactness and less floor space were also benefits derived from the use of CONE-DRIVE.

If you do not know the reasons why CONE-DRIVE gearing is the POSTWAR gearing for machine tools and other purposes, ask for Bulletins listed at left.

CW-41B (for Executives)
CW-41A (for Design Engineers)
745 (Post-Graduate Course for Gears)
632 (CONE-DRIVE in Machine Tools)

CONE-DRIVE DIVISION **MICHIGAN TOOL COMPANY**
7171 E. McNichols Road, Detroit 12, U. S. A.

100 mm. in increments of 0.01 mm. A special 1.005 mm. block in the set makes possible special combinations for closer tolerances where needed. Manufactured from high carbon chrome steel, the blocks are guaranteed to exceed a hardness of 65 Rockwell C. A special aging process using alternate heating and freezing to 120 degrees below zero gives the blocks stability, while exceptional wearing quality is possible because of the surface finish, less than four tenths of one micro inch RMS in the Inspection Grade.

This 40-piece metric set is furnished in a cloth-lined walnut case, where the blocks stand up on end for convenient handling.

Ball-Bearing Pilot Plug Gages Manufactured by Taft-Peirce

Developed by Kemworthy, London toolmakers, to expedite inspection of work in the British war effort, the Emmerton plug gages are available through Taft-Peirce Manufacturing Co., Woonsocket, R. I.

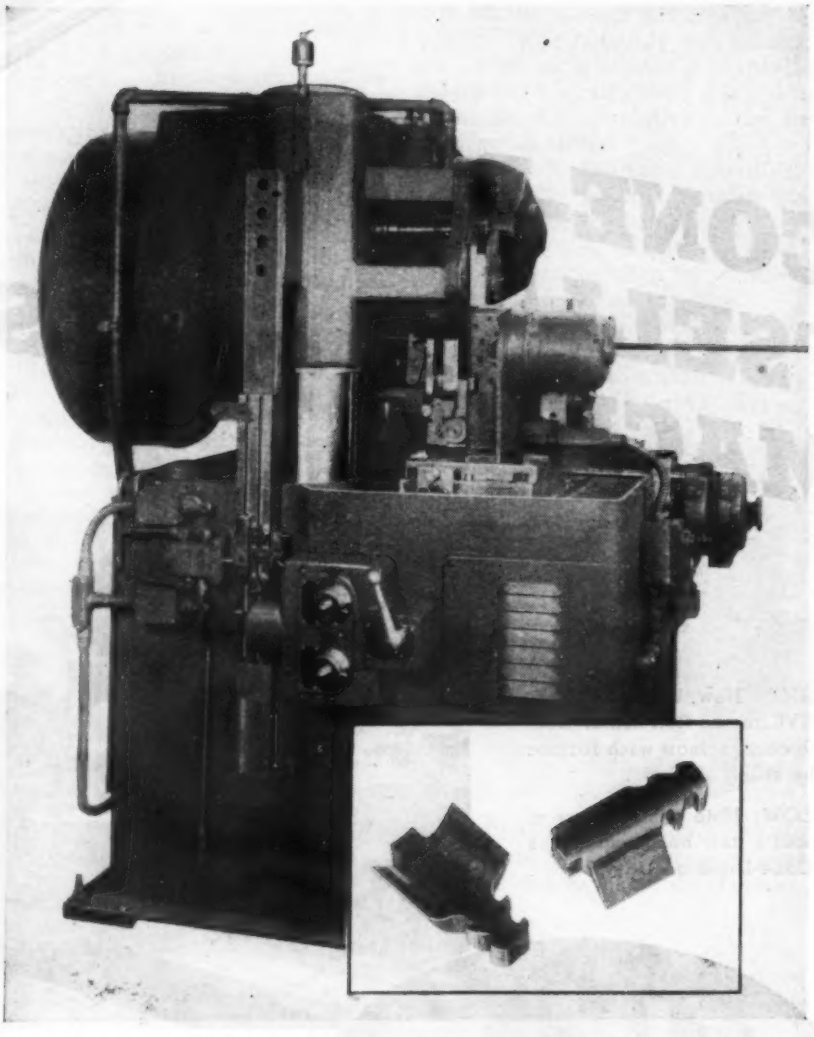
This plug gage is distinguished from others by a pilot ring of hardened steel balls in an annular retainer which encircles the front end of the gaging surface. Since the balls are free to rotate in any direction, they automatically guide gage and work into positive alignment, regardless of the angle at which the gage approaches the work.

Taft-Peirce Emmerton ball bearing pilot plug gages enter the work on their own weight. They cannot jam either in entering or withdrawing, even though the gage diameter is exactly that of the hole. Thus, there is no danger of end wear, shearing, or burring.

These gages have longer useful life than standard plug gages, since shock and wear are distributed over an infinite number of everchanging points on the rotating balls.

Taft-Peirce Emmerton ball bearing pilot plug gages are available in any size desired from 1/4 in. up.

Kent-Owens Automatic Bar Miller Forms Precision Tolerance Parts



Kent-Owens bar stock machine holds full formed cutters to form finish parts automatically. Cutters require no special equipment to form

A machine for automatically milling and cutting off parts from bar stock at high production rates has been introduced by Kent-Owens Machine Co., Toledo, Ohio. One operator can tend two or more machines, his only duty being to insert new bar lengths as they are exhausted. This machine is suited for the manufacture of hinge parts, pole pieces, turbine blades, molding, hardware and similar parts.

The bar stock is automatically fed against an end stop by a torque motor and then clamped hydraulically. The head has three cutter spindles. Form cutters on the two lower spindles form mill the stock and a saw on the upper spindle cuts the piece off to length. The cycle of the head is as follows:

(1) Rapid down (2) Form mill by cutters on two lower spindles (3) Rapid down (4) Cut off by saw on upper spindle (5) Reverse and rapid up to starting position. As the head returns to its upper position, the bar stock is unclamped, advanced into position by the torque motor for a new part and again clamped. All of these movements are continuous and automatic, requiring no attention from the operator.

The head is actuated hydraulically with adjustments so that any desired cycle or feed rate may be obtained. The hydraulic pump and motor are enclosed in the base of the machine.

Fixtures and clamping jaws can be provided to accommodate various cross section shapes of bar stock. The head can be furnished with a single spindle for simple cutting off operations or with a number of spindles.

In One Year . . . .

A Gain of More Than 50%

in sales of LINCOLN PARK *Carboloy* GAGES

THE tremendous increase in the use of Lincoln Park Carboloy gages over the past year clearly indicates the present-day trend toward greater accuracy and economy in inspection operations. This gain is particularly emphasized by the fact that, ever since cemented-carbides were first used in gage manufacture, Lincoln Park has been the largest user of this wear-resistant material for this type of product.

Why are more and more manufacturers rapidly turning to greater use of Lincoln Park Carboloy gages? Here are reasons offered by two manufacturers: "The life of one steel thread plug gage was one 8 hour shift. One of your Carboloy gages has been in use for over 1½ years and is still serviceable" . . . "The average steel gage is good for 5000 pieces. The same gage of Carboloy gives us 250,000 and more." That's real economy in gage costs alone.

Of probably even more importance, Lincoln Park Carboloy gages have made it possible to save thousands of dollars through elimination of the rejection of expensive parts ordinarily inspected with gages made to include allowance for wear. In Lincoln Park Carboloy gages, wear allowance is not necessary. At no time are they "over-size", but are accurate to required limits from the first inspection.

Where *both* money and parts are being saved in inspection, Lincoln Park Carboloy gages are being used.

ARMY E NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1721 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

Sealskin Protects Skin From Effects of Harmful Irritants

A protective compound for the prevention of dermatitis arising from industrial irritants is manufactured by Cadet Laboratories, Worcester, Mass. This compound, when applied once daily to the hands, forms an invisible waterproof coating over the skin which acts as a preventive against infection and from which dirt and grease can be washed with soap and water.

The material, which is known as Seakskin, is in the form of a cream and is packed in large-mouthed jars for easy use.

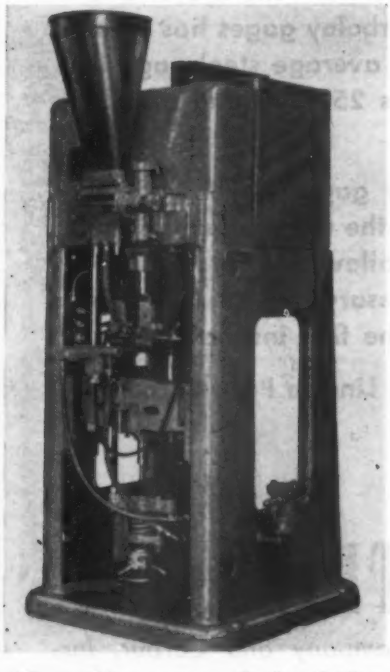
Improvements Incorporated in Stokes Automatic Mold Press

Improvements, based on experience gained by the F. J. Stokes Machine Co., Phila. 20, Pa., are incorporated in the latest No. 200 D model completely automatic molding machine. Among these is a trap or checking device, sensitive to the fraction of a gram, which weighs the finished moldings and operates a safety cut-off to stop the machine in case all molded pieces do not eject into and pass through the trap. Should a piece stick in the mold or should a molding be of insufficient weight, the machine will stop and signal for attention. Thus, possible damage to the mold or machine from double filling or other failure in operation is eliminated and quality of moldings is maintained.

Other features include a combination push-off that ejects mechanically in case the multiple air jets do not blow the molding into the trap; also, a triple-feed device that is readily adjusted to distribute exact quantities of molding powder where desired in the mold.

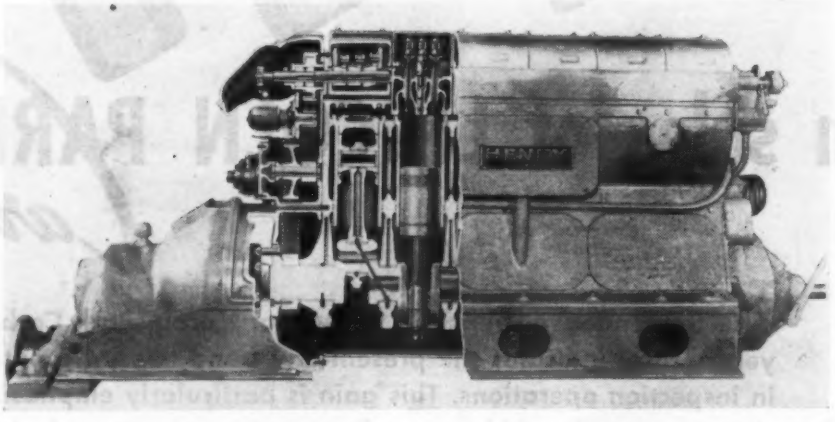
Capacity of this machine is 15 tons; it molds parts with a projected area up to 14 sq. in. and diameters up to 4 in. Output with a single cavity mold is up to 10,000 or more moldings per week (168 hours) and with sub-cavity molds up to 10,000 or more per day, depending on the size of the part.

The machine is self-contained, fully automatic, thoroughly safeguarded, requires a minimum of operating attention, is electrically heated and powered, requires 5 hp.



All working parts of the Stokes automatic molding press are inclosed in the frame structure

Hendy Diesels in Series 20 Develop 190 to 250 Horsepower



Overhead camshaft simplifies fuel supply system of the Hendy Series 20 diesel and permits operation with several cylinders down. Minor repairs can be made while operating

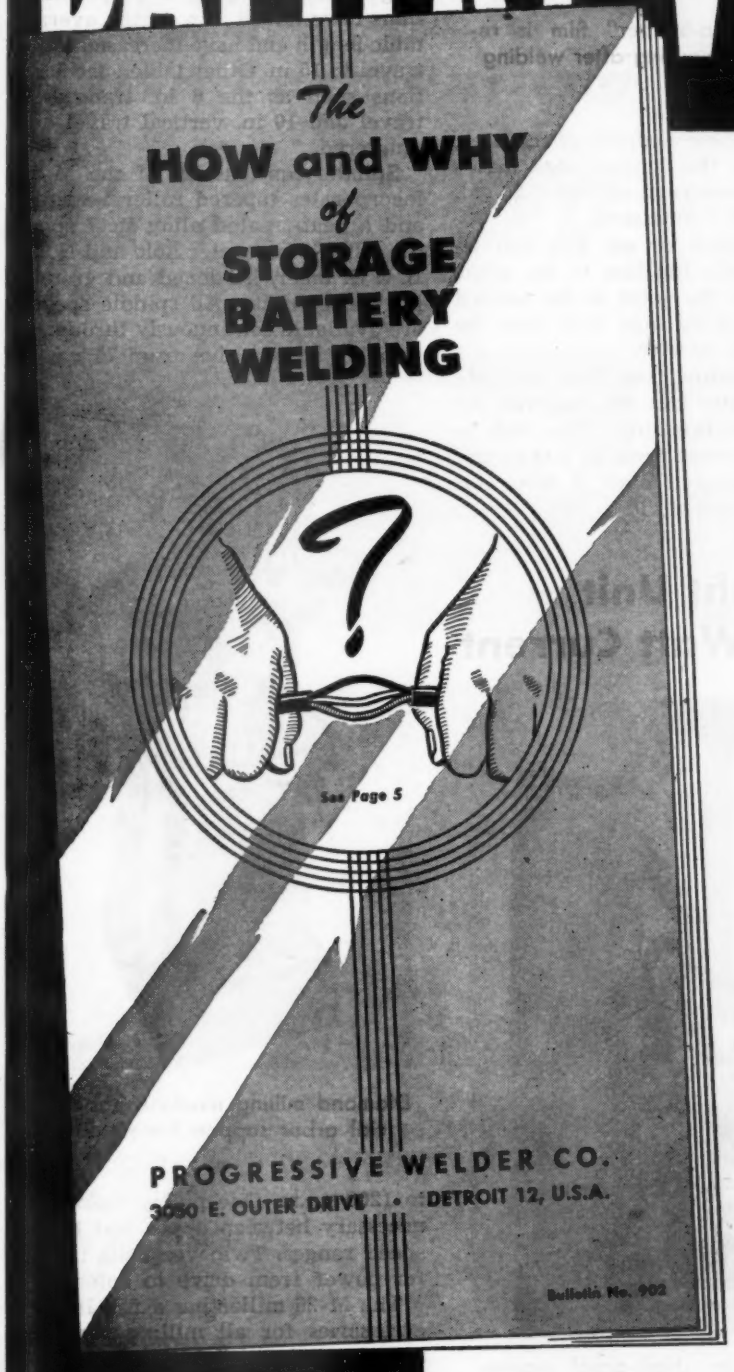
The Joshua Hendy Iron Works, Sunnyvale, Calif., is producing its Series 20 diesels in 6- and 8-cylinder models with a power range of from 190 to 250 hp., at 900 r.p.m. This extends the line of Hendy diesels to include horsepower ratings from 190 to 780 hp. Like the Series 50 engines, the D-26 and D-28 are made in marine, stationary, and diesel-electric models, and are of the four-stroke cycle type, designed for heavy-duty, medium-speed operation. Also like the larger engines, they are air starting and completely inclosed with overhead camshaft, unit fuel pumps and injectors, precision-type bearings, and full pressure lubrication. Marine models are direct reversing.

Series 20 engines are single acting, with 7¼-in. bore and 8½-in. stroke. The cast-iron pistons are of simple design with four compression and two oil-control rings. The piston heads are designed for maximum heat dissipation and efficient combustion. Full-floating wrist pins are pressure lubricated through drilled connecting rods, which are forged of high-strength steel, completely machined and balanced for smooth operation. Bearing caps are bolted to rods with oversize alloy-steel bolts. No shims are required.

Fresh-water cooling is a design feature of the Series 20. This assures freedom from rust, scale, or chemical deposits in water jackets and materially reduces maintenance costs. The use of unit fuel pumps and injectors, operating in conjunction with the overhead camshaft, reduces the number of moving parts and makes unnecessary the use of long, high-pressure fuel lines between a separate injector pump and the nozzles. The entire unit-injector assembly can be quickly removed for cleaning and inspection, enabling all servicing to be done under bench conditions.

Optional engine equipment includes clutch power takeoffs, engine-mounted generator, pyrometer and thermocouples, automatic alarm or shutdown equipment and overspeed governor.

BATTERY WELDING



Here are the answers to your questions about the most striking new development in resistance welding—making resistance welding useable wherever there is enough power to operate a simple battery charger.

WHAT IT IS . . .

How does it work and why?

WHERE TO USE IT . . .

What kind of welding?
What kind of machines?
How much power?

WHAT ABOUT INSTALLATION? . . .

Portability?
Floor space?

WHAT ABOUT COST? . . .

Initial cost?
Operating cost?
Efficiency?

HOW IS IT OPERATED? . . .

How much skill?
What kind of controls?
Safety?

WHAT ABOUT MAINTENANCE? . . .

How much skill required?
Reliability?
Adjustments?

Ask for 12 page booklet (No. 902)
"How and Why of Battery Welding"

BUY U. S. WAR BONDS

PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT 12, U. S. A

Non-Spatter Welding Film Announced by Lincoln Electric

A liquid designed to minimize the adherence of welding spatter to metal and reduce cleaning time has been introduced by The Lincoln Electric Co., Cleveland, Ohio.

This product is known as Lincoln "Non-Spatter" film. The liquid has been tested in the field and found to possess the following characteristics: Welding can proceed after application, whether the film is wet or dry. Film can be sprayed or painted on work. Priming coats of paint may be readily applied over the film. If it is desired to remove the film before painting, this can be accomplished by washing with water. One application of film is effective for multiple-pass welding. If film is sprayed or painted on parts prior to being normalized, the oxide film and ordinary scale can be removed more easily after heat treating. Material will freeze but freezing has no effect on its properties when thawed out.

Lincoln "Non-Spatter" film is supplied in concentrated form in 5 gal. cans for the convenience of the user. By diluting the concentrated material with three parts of water, 20 gal. of film fluid is obtained.

Lincoln "Non-Spatter" film is removed by washing after welding

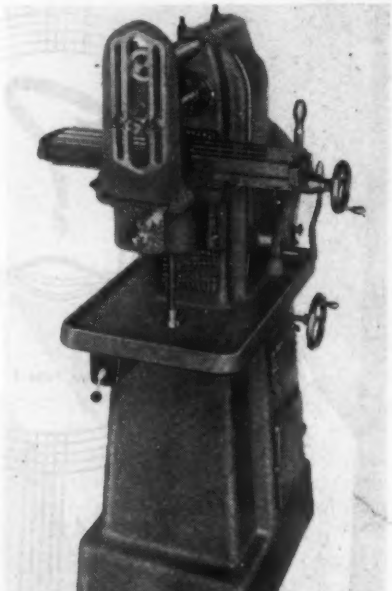
Either brush or air gun can be used to apply the film to the areas adjacent to the joint to be welded and to welding jigs that may be subjected to spatter.

After welding, the film and adhering spatter can be removed by washing or brushing. The film is non-corrosive and can be left on the work or painted over if it is not desired to remove it.

Diamond Milling Machine Provides Greater Capacity

A milling machine announced by the Diamond Tool Co., 3429 East Olympic Blvd., Los Angeles 23, Calif., known as Model M-26, has increased table travel and table area over the Model M-24, which was formerly the largest model made. New specifications have added 2 in. to the overall table length and have increased table travel to 15 in. Other table specifications such as the 6 in. transverse travel and 10 in. vertical travel are unaltered.

Spindle construction of the M-26 incorporates tapered roller bearings and a heat-treated alloy steel spindle with ¾ in. center hole and No. 9 B. & S. taper, hardened and ground for concentricity. All spindle speeds are available continuously through a variable speed drive from 75 r.p.m. to 1200 r.p.m. One pulley change is necessary between upper and lower speed ranges. Twin vee belts transfer power from drive to spindle.

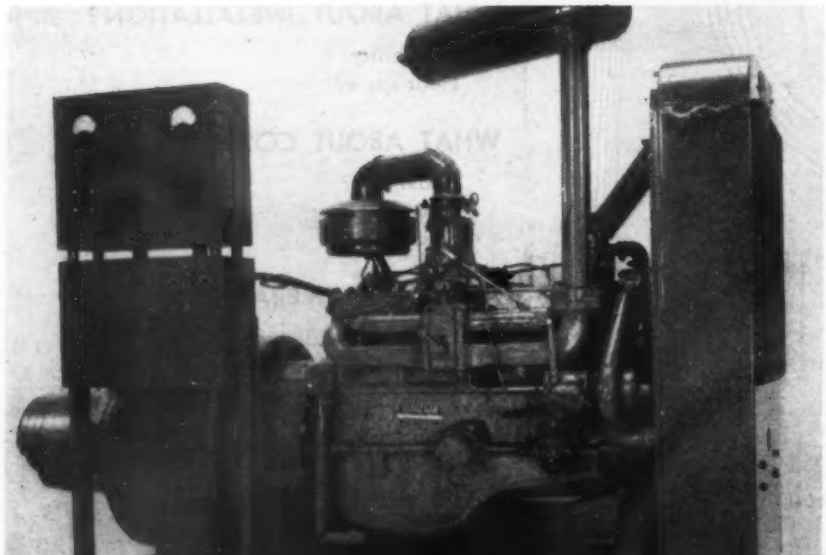


Diamond milling machine has special arbor support for rigidity

The M-26 miller has a full line of accessories for all milling requirements and is available both in tool room models with power longitudinal feed or production models equipped with rack and pinion table feed.

With the special arbor support, extreme rigidity is assured between knee, arbor and overarm for heavy cuts in the toughest material. Cutter

Chrysler Powered Katolight Unit Generates 15,000 Watt Current



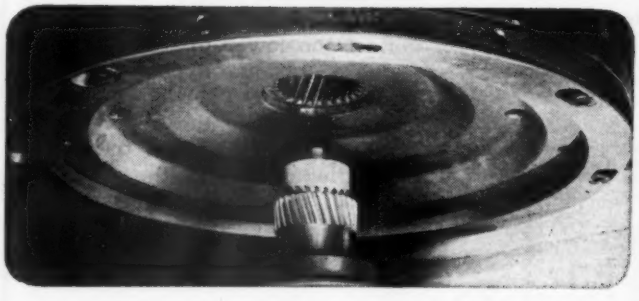
Katolight 15 kilowatt generator set is mounted on shock-proof mounts

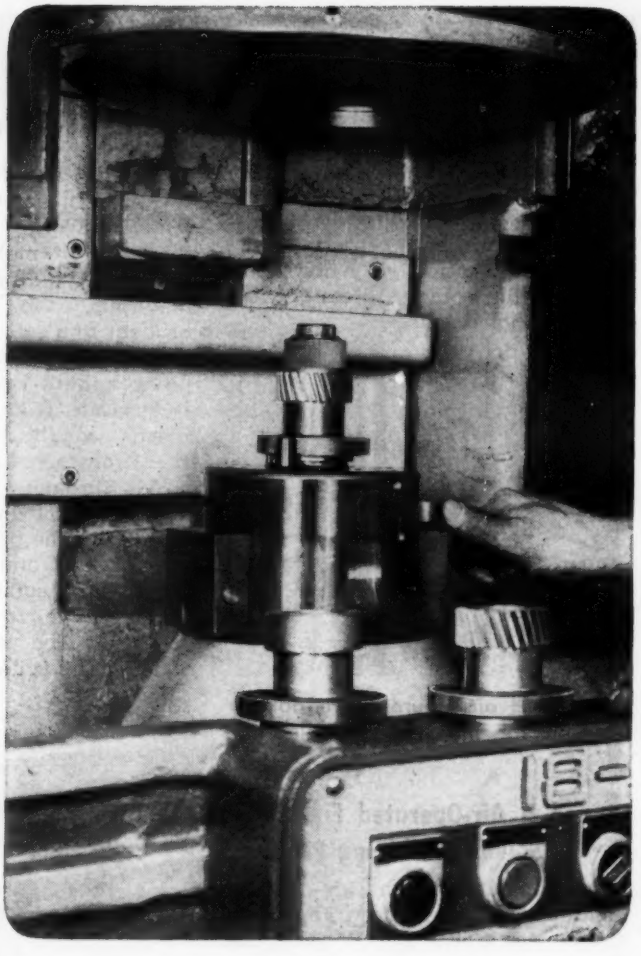
A 15 kilowatt Katolight generator, powered with a model T-118 Chrysler industrial engine, is an addition to the products of the Kato Engineering Co., Mankato, Minn.

The revolving field type generator is a 60 cycle, 3 phase model delivering 120/208 volts at 1200 r.p.m. Coupled unit is 70x24 in. base size and 49 in. high. Weight is 1,860 lbs. without the waterproof enclosure which is supplied if desired.

What they wanted to know about

Faster Gear Cutting the SHEAR-SPEED way





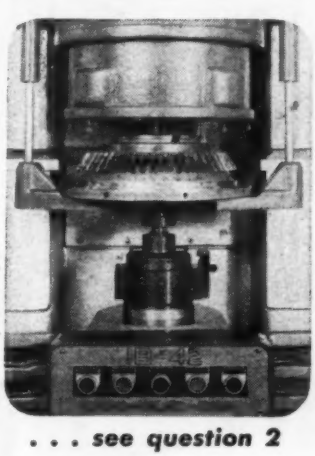
Since the announcement of the revolutionary new SHEAR-SPEED process for cutting all teeth of a gear simultaneously in an almost unbelievably short time, Michigan Tool Company has been flooded with questions regarding the process and machines. Some of the most frequently asked questions and their answers are:

1. *How much time does it save?*
The SHEAR-SPEED will cut a given gear in 1/5th to 1/20th the time required by other processes. Some gears are currently being cut in less than 1/2 minute.

2. *Is it a single purpose machine?*
No. The SHEAR-SPEED can be changed over (by changing the cutter head) by one man in about 20 minutes to cut another size or pitch of gear.

3. *Will it cut both helicals and spurs?*
Yes. By changing the work reciprocating guide. Currently, minimum lead recommended is 10".

4. *Will it cut splines?*
Yes, providing length of spline is less than 3 inches.



. . . see question 2

5. *Are there different models?*
Yes. Currently the SHEAR-SPEED comes in three sizes, for maximum gear outside diameters of 3, 5 and 7 inches respectively.

6. *What kind of tool life do you get?*
This varies with the material being cut. Present indications are that the range is from 10,000 to 25,000 pieces per set of blades.

7. *Do number of teeth affect cutting time?*
No. Cutting time depends only on face width and depth of tooth.

8. *Do you need skilled operators?*
No. Machine cycle is completely automatic. Operator merely loads and unloads.

9. *How accurate is the SHEAR-SPEED?*
Accuracy of product compares favorably with other cutting processes. Correct spacing is built into the cutter head. Correct tooth form is provided in the cutter blades.

We will be glad to answer any other questions you may have.

ORIGINATORS of GEAR SHAVING

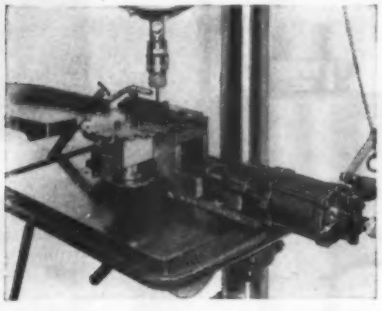
MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

BUY U.S. BONDS STAMPS

capacity is approximately 8 in. maximum.

A gusher type coolant pump and reservoir is available as well as dividing heads, rotary tables, collets, vertical milling attachments, splash trays and vises. Among the latter is the Diamond self centering vise which automatically centers the work to the tool regardless of work thickness variations.



K and H air fixtures have double action for indexing and clearing

K and H Air-Operated Fixture Solves Machining Problems

Development of an air-operated holding fixture has been announced by K & H Corp., Fort Wayne, Ind. While originally designated to eliminate difficulties encountered in tapping heat-treated aircraft parts, the same technique is applied to various other machining operations such as drilling, reaming, counter sinking and milling.

In tapping operations the fixture works entirely from the "A" surface of the nut, holding it square to the axis of the tap to within 0.001 or less total indicator reading. The entire assembly consists of a double action air cylinder; a plunger which is made hollow to permit disposal of chips; a pawl and indexing mechanism and a cam and seat mounted on a suitable frame. A coolant pump supplies cutting oil to the tap, and also serves as a means of removing the chips.

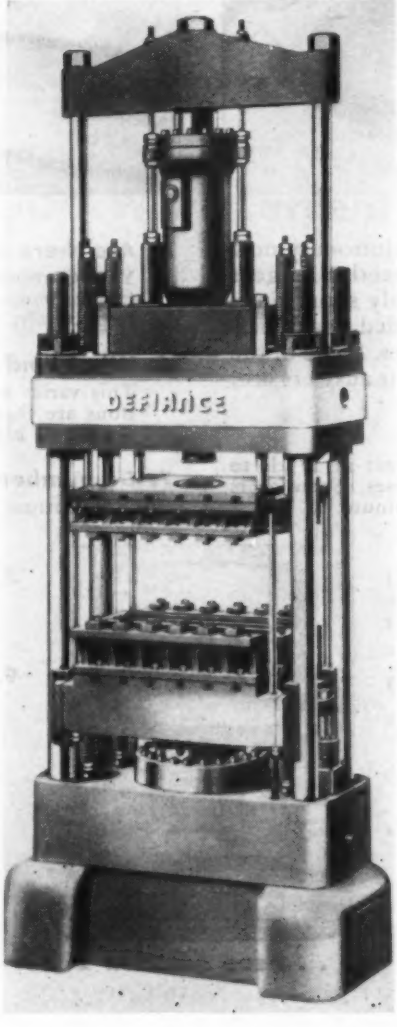
Operation on 35 to 40 lb. line pressure is obtained by use of a 3 to 1 ratio cam operated by an air cylinder having a 4.9 to 1 power increase over regular air line pressure. The index mechanism is operated by the return stroke of the double action cylinder.

This fixture enables one operator to tap 18,000 ¼-28NF3 aircraft nuts in an eight-hour shift. The production record on several millions of these nuts in shops using the fixture shows scrap rejections of less than one one-hundredth of one percent.

Defiance Plastic Molding Press Has Integral Transfer Chamber

A plastic transfer molding press, No. 152, is announced by Defiance Machine Works, Defiance, Ohio. In this type of molding, which is an injection molding of thermosetting materials, the mold charge is brought to a soft plastic condition in a chamber which, in the Defiance press, is built into the machine and is separate from the mold. In this plastic condition, the material is then transferred or injected into the mold through a single opening. After the mold has been completely filled with the material, the application of heat and pressure are continued for a sufficient period to permit complete cure or polymerization in the molded part.

The press is double acting in principle, designed to operate from an accumulator system using pressures up to 3000 lb. per sq. in. There are three platens, the lower or main platen that moves upward, the intermediate or floating platen and the upper or stationary platen which is adjustable up or down in 2 in. increments. The transfer pot is centered in the floating platen and held in place when the upper half of the mold is fastened to this platen. (The pot is not bolted or fastened to the mold.) After the pot it loaded, the lower platen which mounts the lower half of the mold moves upward to close the mold under low pressure, contact of the mold faces causes the floating platen to move upward with the action of the lower platen until it is seated against the upper or stationary platen.



The built-in transfer chamber of the Defiance transfer molding press eliminates the need for individual chambers in each mold

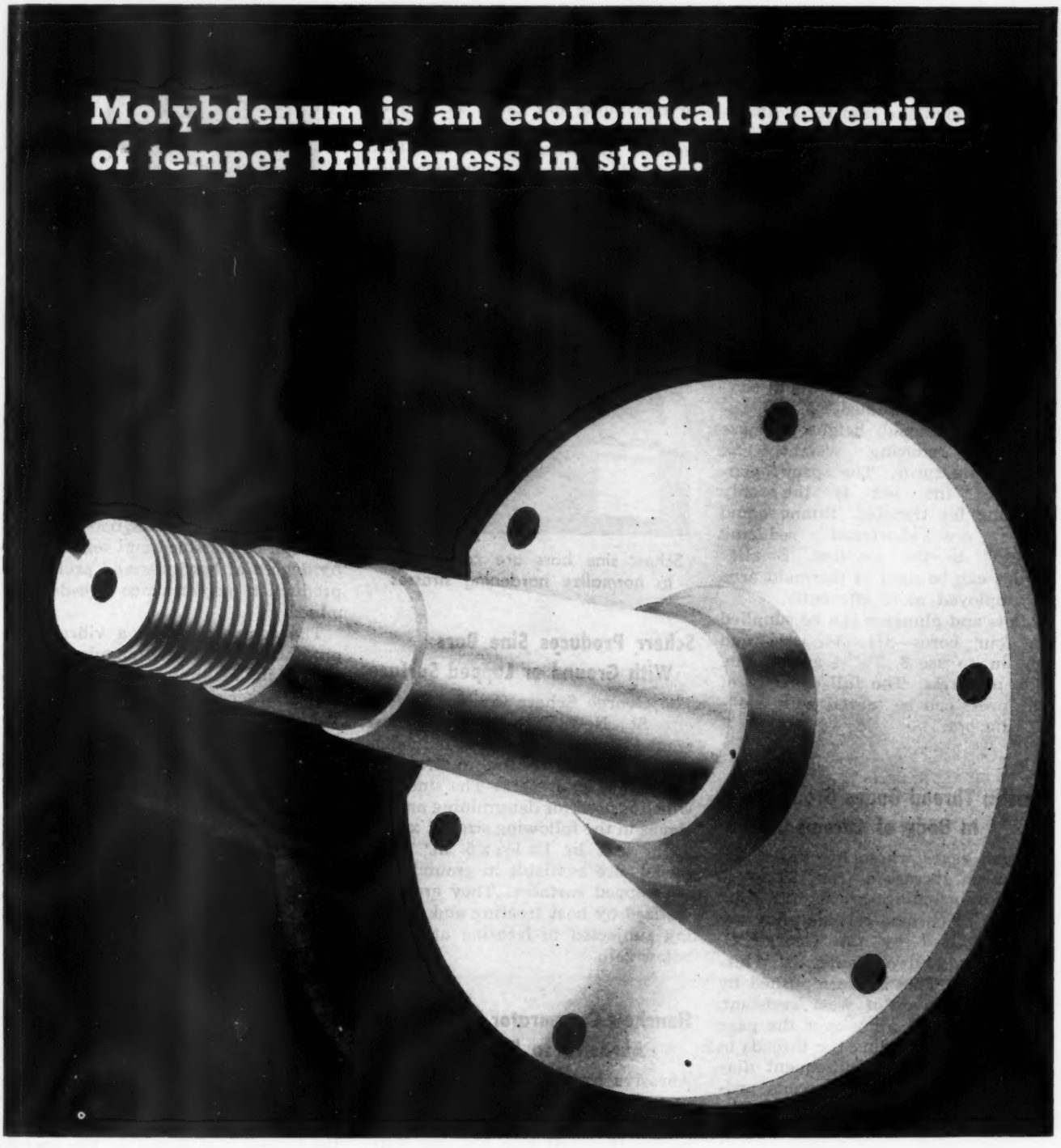
Mounted above the upper platen is the transfer cylinder; the piston is stationary and the cylinder moves. An electrically heated plunger is fastened to the lower end of the cylinder. The transfer cylinder and the lower platen cylinder are placed under high pressure.

The downward movement of the transfer cylinder forces the plunger into the pot, compressing the preforms and making the transfer while the pressure of the lower platen cylinder holds the mold closed. After curing, the pushback cylinders located beside the transfer cylinder raise the plunger, breaking the sprue. The action of these pushbacks also starts the floating and the lower platen downward. The floating platen is arrested after a short downward movement, allowing the mold to open as the lower platen continues its downward movement by action of the pullback cylinder attached to its end.

This press has a box type cast steel head or upper platen, designed for strength and rigidity. Heat-treated alloy steel tie rods provide open construction for mold accessibility and steam lines. Heavily ribbed mold supports insure positive closing of molds. Cast steel and high test cast iron are used throughout. Cylinders are cast of special close grained metal ground and honed. All packings are accessible and arranged to prevent material contamination from seepage.

Maximum working pressure of 3000 lb. per sq. in. exerts a mold clamping pressure of 170 tons

Molybdenum is an economical preventive of temper brittleness in steel.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

through the main ram, diameter 12 in. A transfer pressure of 42 tons (at 3000 lb. per sq. in.) is exerted through the transfer cylinder, diameter 6 in.

Maximum mold width is 18 in., length 26 in., minimum working space or daylight between platens is 15 in., which can be increased in 2 in. increments up to 23 in. Platen stroke is 15 in. With upper platen in highest adjustment, minimum height of mold is 13½ in.; with upper platen at lowest adjustment, minimum mold height is 5½ in. Since the pot is separate from and not fastened to the mold, mold construction is simplified. Molds require only enough height to house cavities, reducing weight and shortening sprue. The sprue opening to the pot is the only opening for transfer. Runners and gates are shortened, reducing "wash" to the cavities. Smaller molds can be used as the mold area is employed more efficiently.

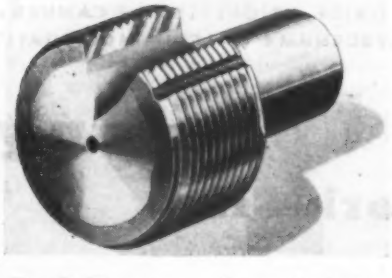
Pots and plungers can be supplied in four bores—3¼, 3¾, 4¼ and 4¾ in. to use 3, 3½, 4 and 4½ in. dia. preforms. The full capacity of the press can be served with a 4¾ in. dia pot.

Griffin Thread Gages Ground In Body of Chrome-Carbide

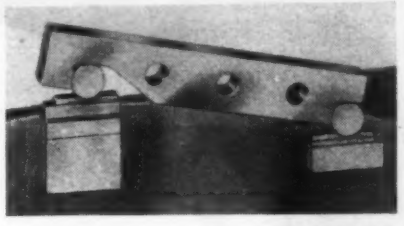
Thread gages whose life reportedly has been increased from 20 to 60 times by grinding threads in a solid deposit of chrome-carbide alloy are manufactured by the George O. Griffin Co., 1301 W. Hadley St., Whittier, Calif. This is accomplished by welding a layer of wear resistant, chrome-carbide alloy over the gage blanks, then grinding the threads in the solid deposit. Subsequent diamond lapping of the threads produces gages to exact dimension. The thread is not plated, but is composed of solid chrome carbide alloy which extends below the root of the thread.

The Griffin process can be applied to reclaiming old gages as well as producing new gages. In case of the former, the worn threads are first removed, a deposit of chrome-carbide alloy welded over the blank which is then surface ground to correct O.D. and threaded.

The Griffin process can be applied to thread plug gages of ¼ in. O.D. and to thread ring gages starting at ¾ in. I.D.



The Griffin process of manufacturing gages provides a body of chrome-carbide on a base of ordinary material



Scherr sine bars are cold-treated to normalize hardening stresses

Scherr Produces Sine Bars With Ground or Lapped Surface

The George Scherr Co., 200 Lafayette St., New York 12, N. Y., announces the addition of four models of sine bars to its line of precision measuring equipment. The sine bar, which is used for determining angles, comes in the following sizes: 1 x ⅝ x 5 in. and in 1 x 1¼ x 5 in. Both models are available in ground only and lapped surfaces. They are normalized by heat treating and by being subjected to freezing at 100 F. below zero.

Hanchett Comparator Grades Abrasive to Duplicate Finish

Abrasive hardness and bond structure testing is the purpose of the Hanchett comparator, manufactured by the Hanchett Mfg. Co., Big Rapids, Mich. This precision instrument offers an accurate, comparative method of analysis.

A diamond or special alloy steel grading tool oscillating under a given load gradually penetrates the grinding wheel or other material to be graded. The number of oscillations is pre-determined for each material, based on comparative tests made on wheels, hones or material previously proven satisfactory. When the instrument completes its specified number of oscillations, the grading tool records the depth of penetration within 0.001 in. on an indicator. Thus, grinding wheels of the same hardness and bond structure can be classified and segregated by degree of hardness and probable production performance pre-determined.

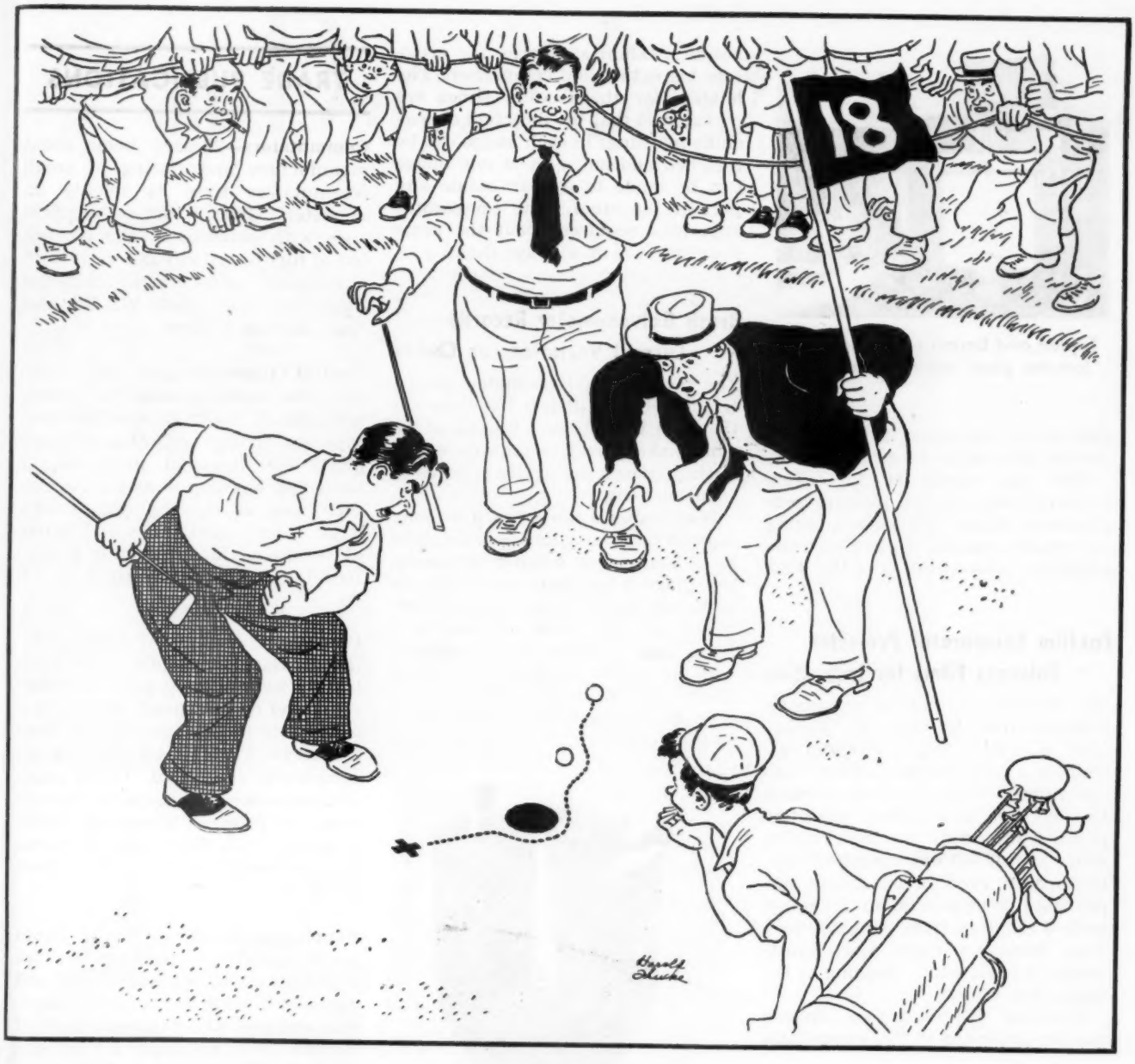
Hanchett comparator tests abrasive wheels for resistance to a standard impact delivered by a standard load, point and oscillation

The comparator has a vibration-proof base and a rectangular table 15 x 22 in. Maximum work height is 6 in. (Larger sizes can be furnished.) Table is adjustable up and down by handwheel for proper setting of work. Lever handle raises and lowers tool. This permits re-positioning of work without changing setting of table. The timer, set for required number of oscillations, automatically shuts off on completion of cycle. Spindle is constructed to withstand heavy thrusts and is mounted in anti-friction bearings.

The comparator offers the user of grinding abrasives a means for checking wheel specifications before mounting grinding wheels on machines. It makes possible the production of parts of sustained uniformity of finish on production runs. The comparator also simplifies the selection and replacement of grinding wheels and hones by the operator.

Triplett and Barton Develop Automatic Density Computer

A recording densitometer that is a product of Triplett and Barton, Inc., Burbank, Calif., automatically computes a logarithmic graph of its findings, completing in thirty seconds a permanent curve that formerly required a number of individual hand operations and involved the risk element of human error. Designed to detect variations in photographic or radiographic film, the principle of operation can be utilized for mate-



Nothing Rolls Like a Ball . . .

According to the annoyed gentleman above, that's *bad*. According to his opponent, that's *good*.

And, according to Industry, faced with ever-new problems of higher speeds, heavier loads and greater precision, that's the answer to many prayers.

For the *ball* bearing is fundamentally different. It is outstanding for free-rolling, precise location of parts, for simplified design, with low maintenance costs.

In millions of applications, New Departure Ball Bearings are proving their unique fitness for the new scheme of things mechanical.

We know of no other bearing that has as many advantages as the *ball* bearing. Particularly the *ball* bearing backed by New Departure's experience and technical skill.

•

Our 112 page illustrated book "Why Anti-Friction Bearings" is mighty interesting. May we send you a copy?

NEW DEPARTURE
BALL BEARINGS

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NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN. • Branches in DETROIT • CHICAGO • LOS ANGELES and other principal cities

Triplett and Barton recording densitometer plots sensitometric strips

rials where variations in the subject can be detected by electronics.

The unit eliminates the effort formerly required in plotting sensitometric strips. Automatic plotting also makes possible a more accurate graphical representation of the data.

Faxfilm Comparator Projector Enlarges Films for Inspection

The Faxfilm comparator apparatus, manufactured by Rex D. McDill, 5107 Mayfield Rd., Cleveland 21, Ohio, is a complete projection booth containing twin micro-projectors. Use of the first-surface reflectors permits projection of two Faxfilm slides at full 100 dia. magnifications, the images, each 20 in. square, appearing side by side on an inspection table 6 in. away from the projectors. This feature permits fine adjustments in focus while standing at the inspection table.

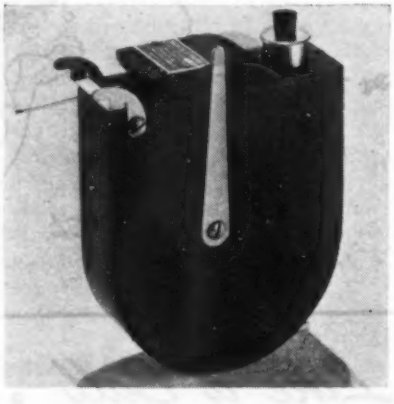
Faxfilms of production finishes may be projected in this comparator beside Faxfilm standards for accurate inspection and comparison. The holders for the Faxfilm slides are movable so that the direction of machine markings in each image can be matched and any part of one image can be made to appear beside any part of the other. The comparator apparatus requires about the same floor space as an average desk.

Faxfilm comparator projects samples for comparison with standards

Brush Galvanometer Records Current Variations on Charts

The recording galvanometer, manufactured by the Brush Development Co., 3405 Perkins Av., Cleveland 14, Ohio makes direct recordings of frequency, range and cyclic changes of small currents.

It embodies a low mass, 3 in. long tapered tube recording pen, actuated by a permanent magnet penmotor. The pyrex tipped pen records directly in ink, on a moving paper chart, pressures, vibrations, strains, currents and voltages of frequencies from d.c. to 120 cycles per sec. It has no overshot up to 70 cycles per sec. at a maximum swing amplitude of 20 mm. each side of the center line.



Brush recording galvanometer can be spaced on 1¾ in. multiples

Frequency response is flat to 70 c.p.s., accurate to 120 c.p.s. Pen can be conveniently centered on, or raised from, a chart.

Impedance of the penmotor is 1500 ohms. Minimum sensitivity is 1.1 mm. per volt, 1.6 mm. per ma., 21 volts full scale.

Overall dimensions are 5 in. high × 4 in. wide by 1⅝ in. thick. Four 10-24 tapped holes are located in the rear face for convenient mounting. A large ink well minimizes frequency of refilling. Available with 3-speed paper drive (2 in. wide chart), one or two channels and single speed paper drive (12 in. wide chart), four to six channels.

TRADE PUBLICATIONS

Commutators—20-page book about manufacture and testing of small commutators from ½ to 2½ in. diameter. Gives a list of standard sizes with dimensions; and a stock list of high-speed circular saws with dimensions and prices. Han-Kor Sales Co., Inc., 1847 W. Bethune Ave., Detroit 6, Mich.

Control Units—Manual No. A-100 describes standard units for remote mechanical control: specifications, capacity charts and diagrams are given for universal shaft, steady shaft and bevel gear assemblies for such uses as opening and closing large valves, ventilators and banks of windows. M. L. Bayard & Co., 1904 Indiana Ave., Philadelphia 32, Pa.

Controls—Handbook of Engineering Design Data on remote control actuation by a sliding inner member consisting of steel beads strung on a wire cable inclosed in rigid or flexible cable. Fittings and covering are completely waterproof. Thirty pages of dimensioned diagrams for various types of fittings. Simmonds Aerocessories, Inc., Simmonds Products, Inc., 30 Rockefeller Plaza, New York 20, N. Y.

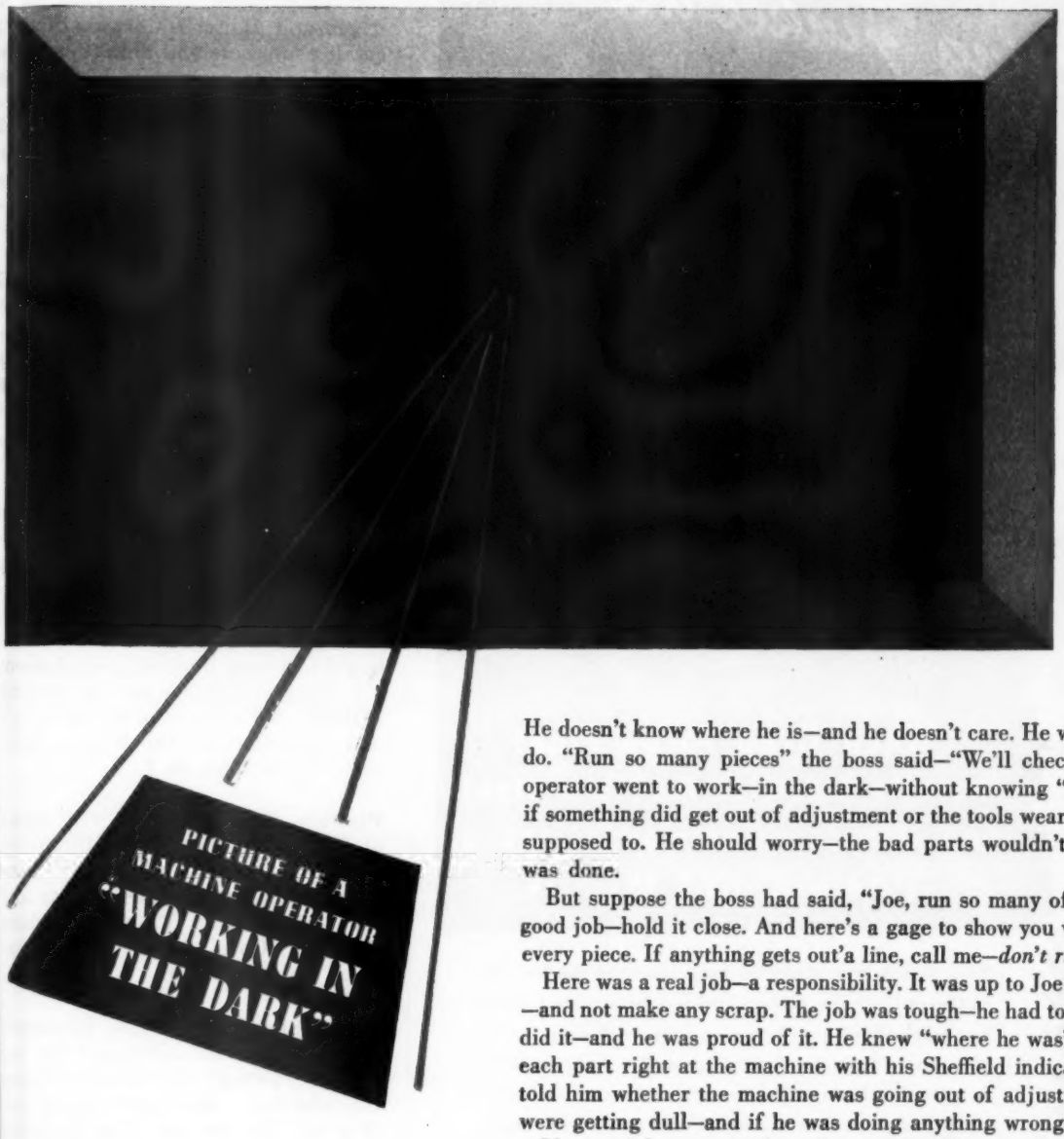
Couplings—Handbook No. 6 about quick disconnect couplings for the transmission of various fluids and gases at a wide range of temperature and pressure. Eighteen pages of sketches with necessary dimensions. Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland, Ohio.

Duplicating—Catalog No. 45-8 contains 40 pages illustrating many types of hand-operated bench forming machines and their product. O'Neil-Irwin Mfg. Co., 317 8th Ave., South, Minneapolis 15, Minn.

Fasteners—24-page book illustrates numerous types of Stalock all around fasteners. Adel Precision Products Corp., Van Owen and Cleon Sts., Burbank, Calif., and 1444 Washington St., Huntington, W. Va.

Gages—Leaflet describes many types of dial-indicator snap-gages with retractable anvils which are Norbide tipped, in sizes from 0 to 1.000 in., 1.000 to 2.000 in., and 2.000 to 3.000 in. with minimum graduation of 0.0001 in. Leaflet describes micrometer comparators with a minimum

HE *Doesn't know* WHERE HE IS!



He doesn't know where he is—and he doesn't care. He was given just a job to do. "Run so many pieces" the boss said—"We'll check 'em later!" So the operator went to work—in the dark—without knowing "where he was." What if something did get out of adjustment or the tools wear faster than they were supposed to. He should worry—the bad parts wouldn't show up till the job was done.

But suppose the boss had said, "Joe, run so many of this. It's got to be a good job—hold it close. And here's a gage to show you where you are. Check every piece. If anything gets out'a line, call me—*don't run scrap!*"

Here was a real job—a responsibility. It was up to Joe to make GOOD parts—and not make any scrap. The job was tough—he had to hold it close. But Joe did it—and he was proud of it. He knew "where he was" because he checked each part right at the machine with his Sheffield indicating gage. The gage told him whether the machine was going out of adjustment—when the tools were getting dull—and if he was doing anything wrong.

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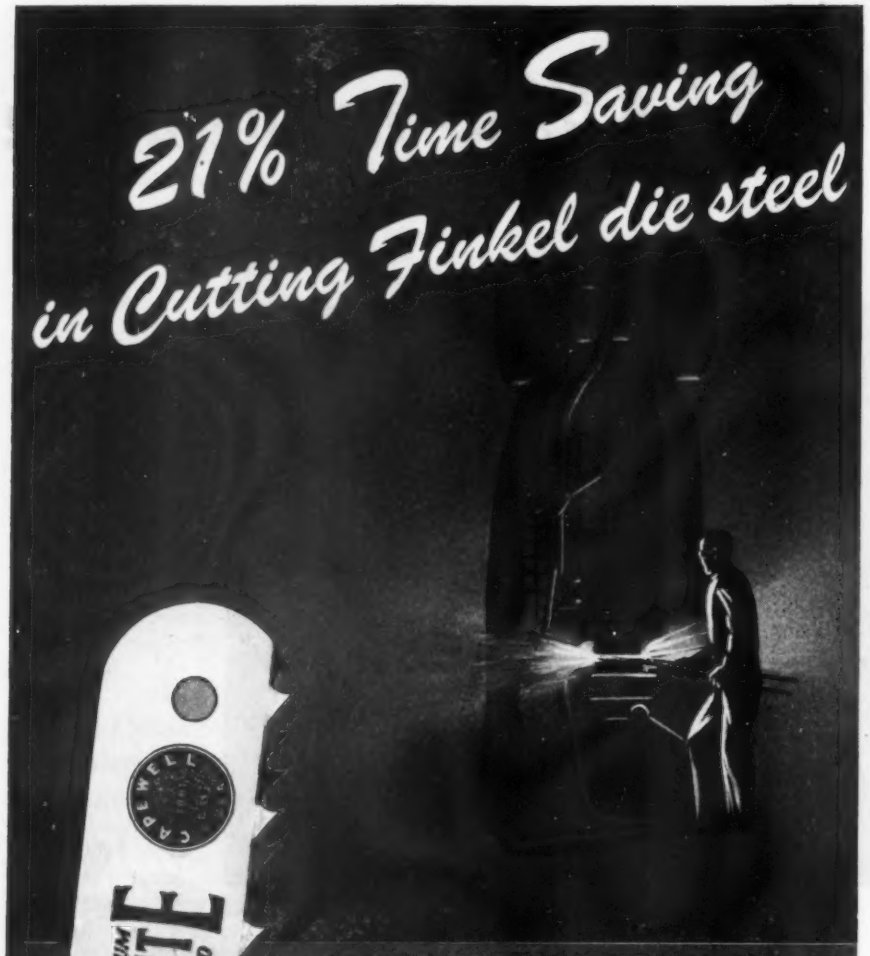

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CAPEWELL 1881 USA

The trend is to TECHNITE, the molybdenum high speed hack saw blade

graduation of 0.0001 in. and a range depending upon the size and type of instrument. Federal Products Corp., 1144 Eddy St., Providence 1, R. I.

Gages—Folder illustrates and gives dimensions of carbide tipped Round-test plug gages, Renew Life limit gages and Handi-Blox size blocks; catalog numbers and dimensions are tabulated for numerous size ranges from 0.250 in. to 8.000 in. and tolerances of from 0.00006 in. to 0.00032 in. depending upon the size and type of gage. Yankee Precision Products Co., 595 New Park Ave., West Hartford 10, Conn.

Hydraulic Circuits—Bulletin 011-G of 26 pages illustrates many types of mechanically and electrically operated hydraulic equipment such as valves, pumps and cylinders, giving illustrations and piping diagrams of applications. John S. Barnes Corp., 301 S. Water St., Rockford, Ill.

Hydraulic Equipment — Bulletin 510-A describes and illustrates hydro-pneumatic pit jacks, including the hand-operated telescope, air-engine driven, drop pit and other special types. Bulletin 560-A describes and illustrates hydraulic equipment for railroad shops used for forcing cylinder liners, crankpins, bushings, and bending rails. The Watson-Stillman Co., Roselle, N. J.

Plastics—Form No. 213 "The Story of Plastic Molding" is an illustrated discussion of the properties, types, manufacturing processes, molds and uses of plastics. Chicago Molded Products Corp., 1020 N. Kolmar Ave., Chicago 51, Ill.

Plastic Sheets—Especially processed sheets have been developed for accurate drawings and close tolerance reproduction. Standard sheets are 51¾ in. by 144 in. The material holds to close tolerances and has low moisture absorption; may be obtained in translucent white or opaque sheets varying from 0.010 in. to 0.015 in. thickness. Direct Reproduction Corp., 22 E. 40th St., New York 16, N. Y.

Pumps—Publication AQB 400.1 describes and gives capacities of 10 sizes of oil-lubricated motor-driven turbine pumps with inclosed impellers for deep well applications. Publication AQB 500.1 describes and illustrates 12 sizes of vertical propeller pumps for shallow well, drainage, irrigation and other service such as cooling water.

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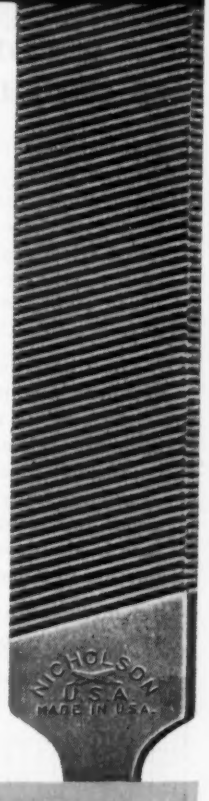

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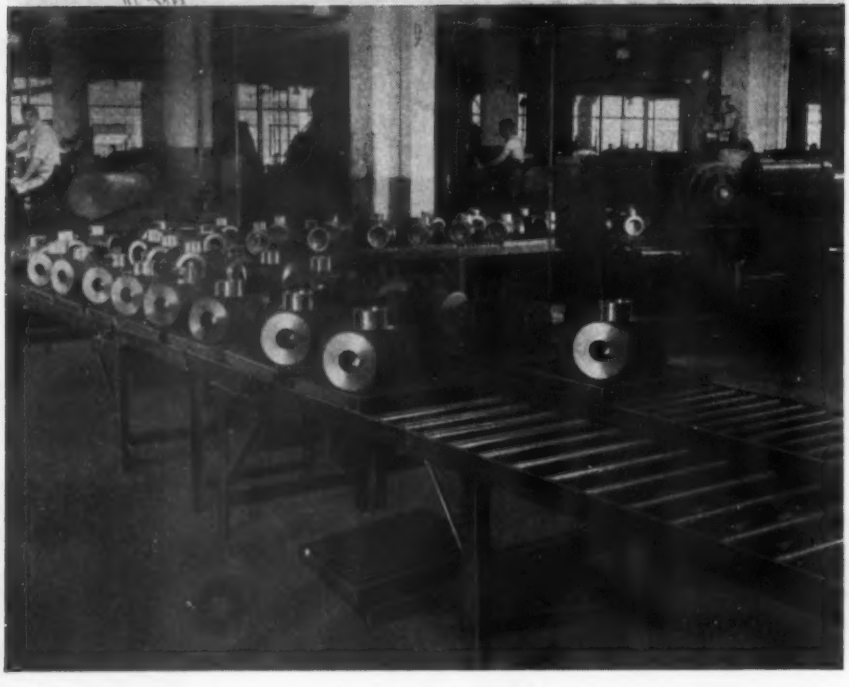

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Screws—24-page pictorial book illustrates automatic equipment for the manufacture of turned and headed parts, also examples of bar stock parts from automatic lathes. Federal Screw Works, 3401 Martin Ave., Detroit 10, Mich.

Spray Booth Compound — Bulletin 8-T1 describes the use of a water soluble compound capable of "wetting out" various pigments, oils and resins, which accumulate about a spray booth and in the exhaust stack; not a caustic. The Pentone Co., Tenafly, N. J.

Steel — Three air-hardening tool steels are described in a folder. Due to slow, uniform cooling, internal stresses are virtually eliminated; grinding, stoning, lapping, fitting and straightening operations are reduced to a minimum. The Carpenter Steel Co., 309 W. Bern St., Reading, Pa.

Taxation—Bulletin No. 1550 is a recommendation with respect to federal tax policy: a discussion of the over-all factors concerning excess profits, corporate and all other forms of taxation. Machinery and Allied Products Institute, 720 20th St. N.W., Washington 6, D. C.

Valves—Circular No. 200 describes valves of many types for the automatic and remote control of liquids and gases such as safety shut-off and trip, pilot, explosion-proof and special valves. Automatic Switch Co., 41 E. 11th St., New York 3, N. Y.

Threads—Form 4452 describes a centerless thread generator for forming threads on blanks by the use of large diameter circular rolls for a wide range of thread pitches and diameters at high production rates. The Steinle Machine Co., Hartford, Conn.

Welding—12-page book gives data about projection welding; illustrated are various types of headed steel products suitable for this type of welding. The Ohio Nut & Bolt Co., Berea, Ohio.

Zinc—"Practice in Machining Zinc Alloy Die-Castings" describes and recommends the best methods for the customary machining operations with the necessary types of tools; there are 67 pages of information. The New Jersey Zinc Co., 160 Front St., New York 7, N. Y.

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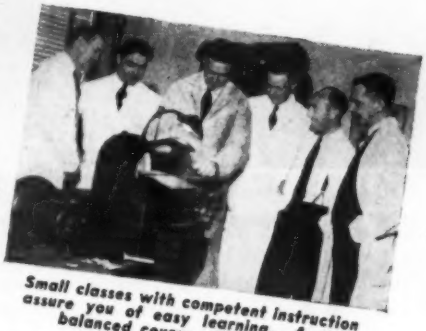

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NEW BOOKS

ELECTRIC POWER DISTRIBUTION FOR INDUSTRIAL PLANTS—*Published by The American Institute of Electrical Engineers, 33 W. 39 St., New York, N. Y. 109 pages. $1.*

This exhaustive report is intended to promote the use of sound engineering principles in the design of electric power distribution systems for industrial plants, and in the selection of equipment for such systems. The booklet analyzes service requirements, voltage regulation problems, load characteristics and distribution system characteristics, and also deals with the selection of equipment for distribution systems. Operating and maintenance problems are included only as they affect system and equipment selection.

Charts and tables indicating power, load, and other factors are presented along with sketches of various types of distribution systems and their location in plants. Protective measures are reviewed.

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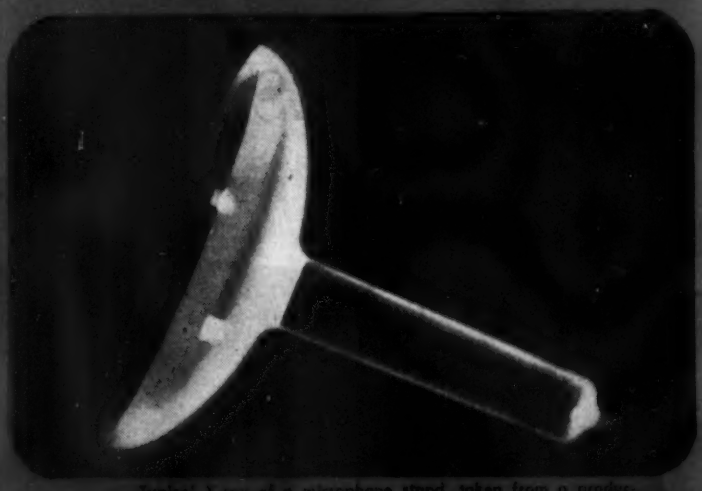
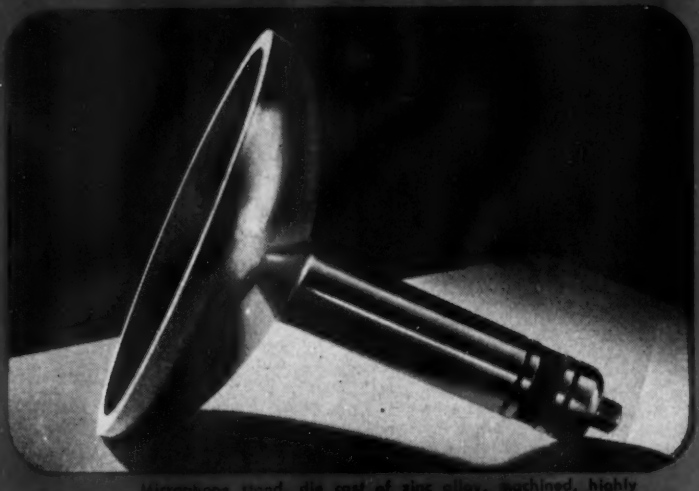


Typical X-ray of a microphone stand, taken from a production run, to insure that porosity is kept at a minimum.



Microphone stand, die cast of zinc alloy, machined, highly polished, chrome plated and painted, by Auto-Lite.

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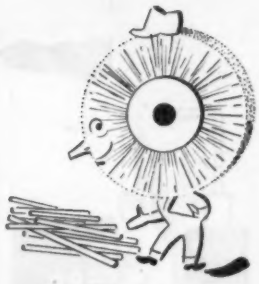

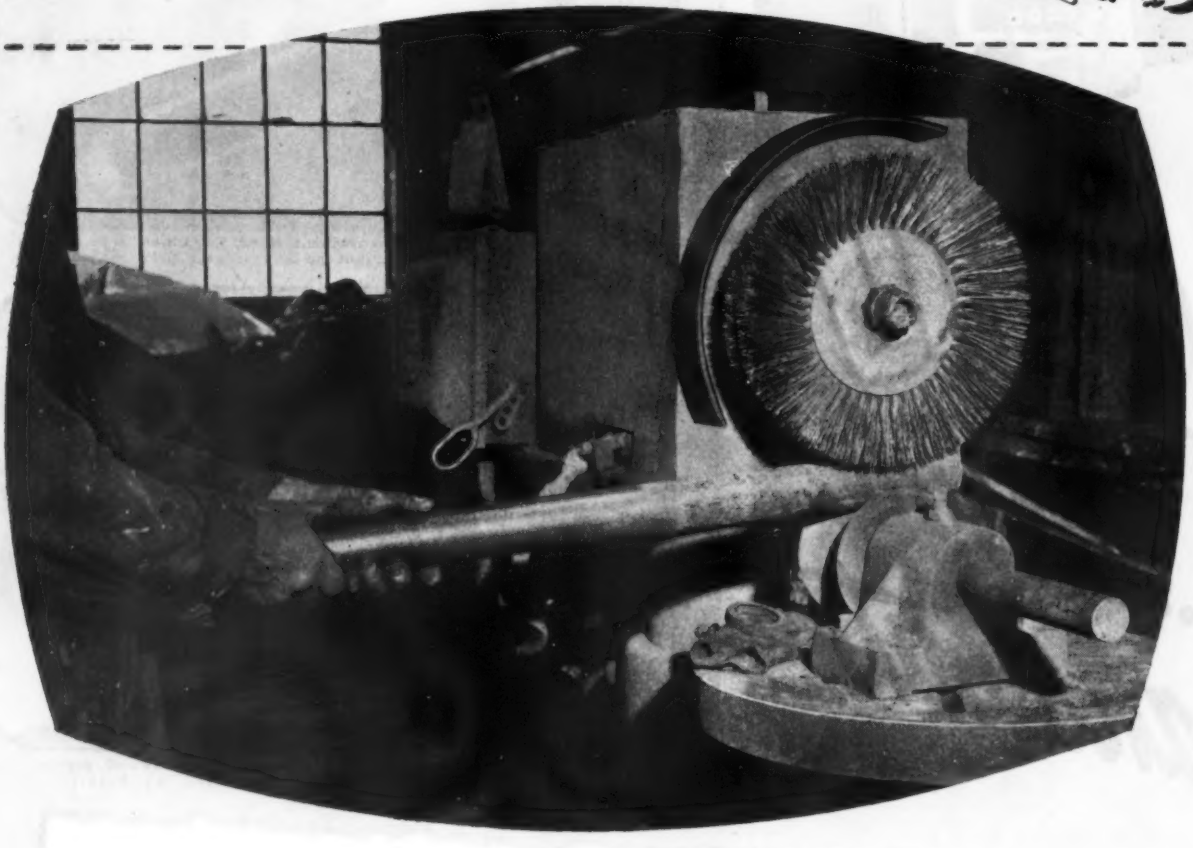

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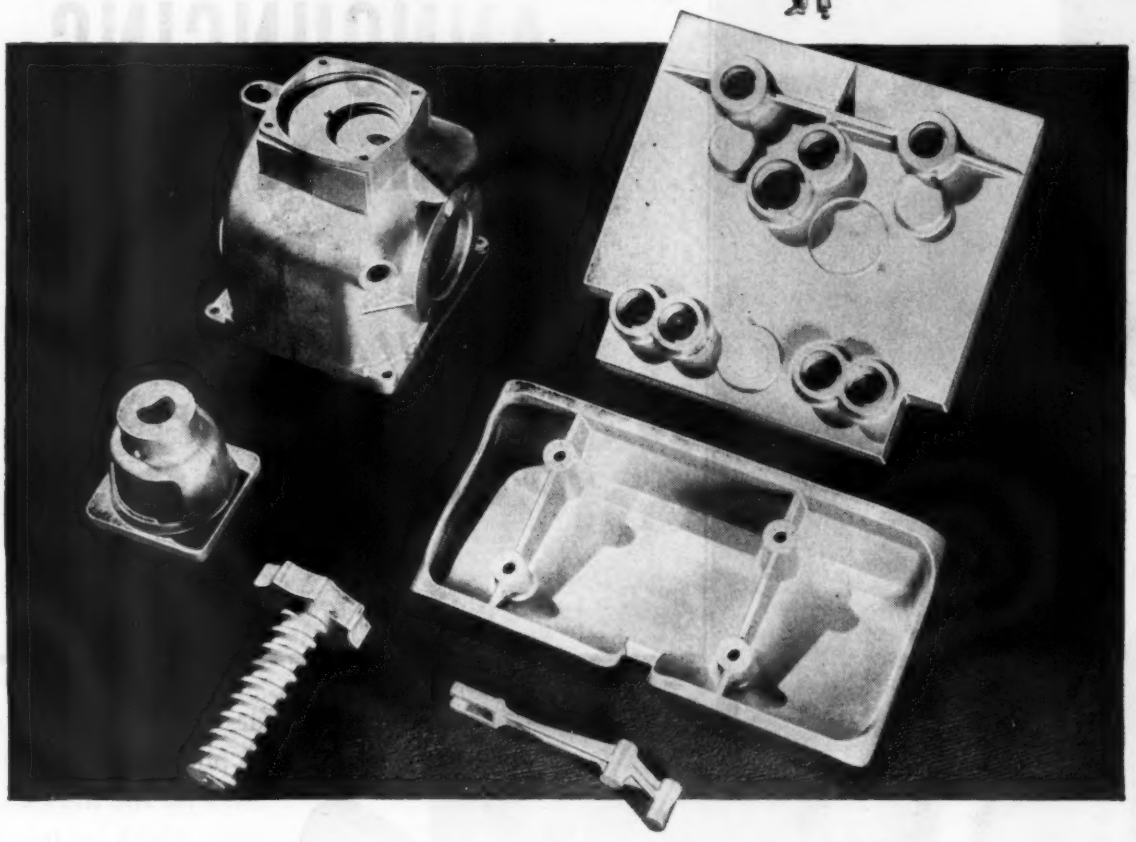

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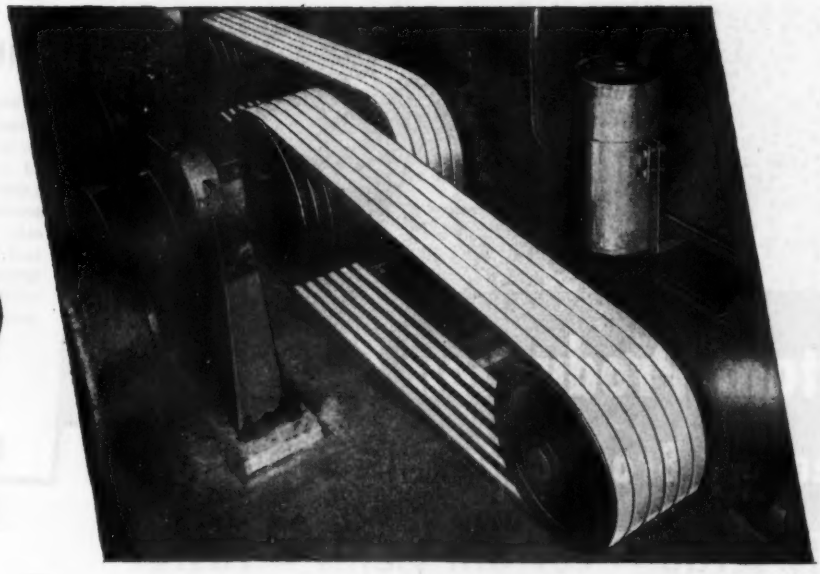

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NO ONE before the war had ever built a V-Belt that could stand the service now daily delivered by Gates V-Belts on army tanks, tractors and self-propelled big guns. Gates developed these greatly superior V-Belts through intensified, specialized research—and Gates is building these belts entirely of synthetic rubber.

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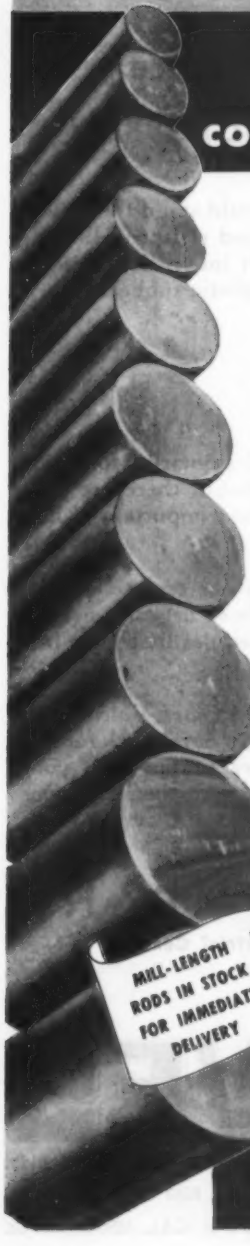
Important Production Economies with Bearing Bronzes in This New Form

No costly scrap — certain yields — faster production on screw machines

with Ampcoloy continuous cast bronze rods



For the first time, certain bronze alloys — previously available only as sand, permanent mold, or centrifugal castings — are now produced in 10 foot lengths by a continuous casting process, exclusive with Ampco in the cast bronze field.

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will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*

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A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

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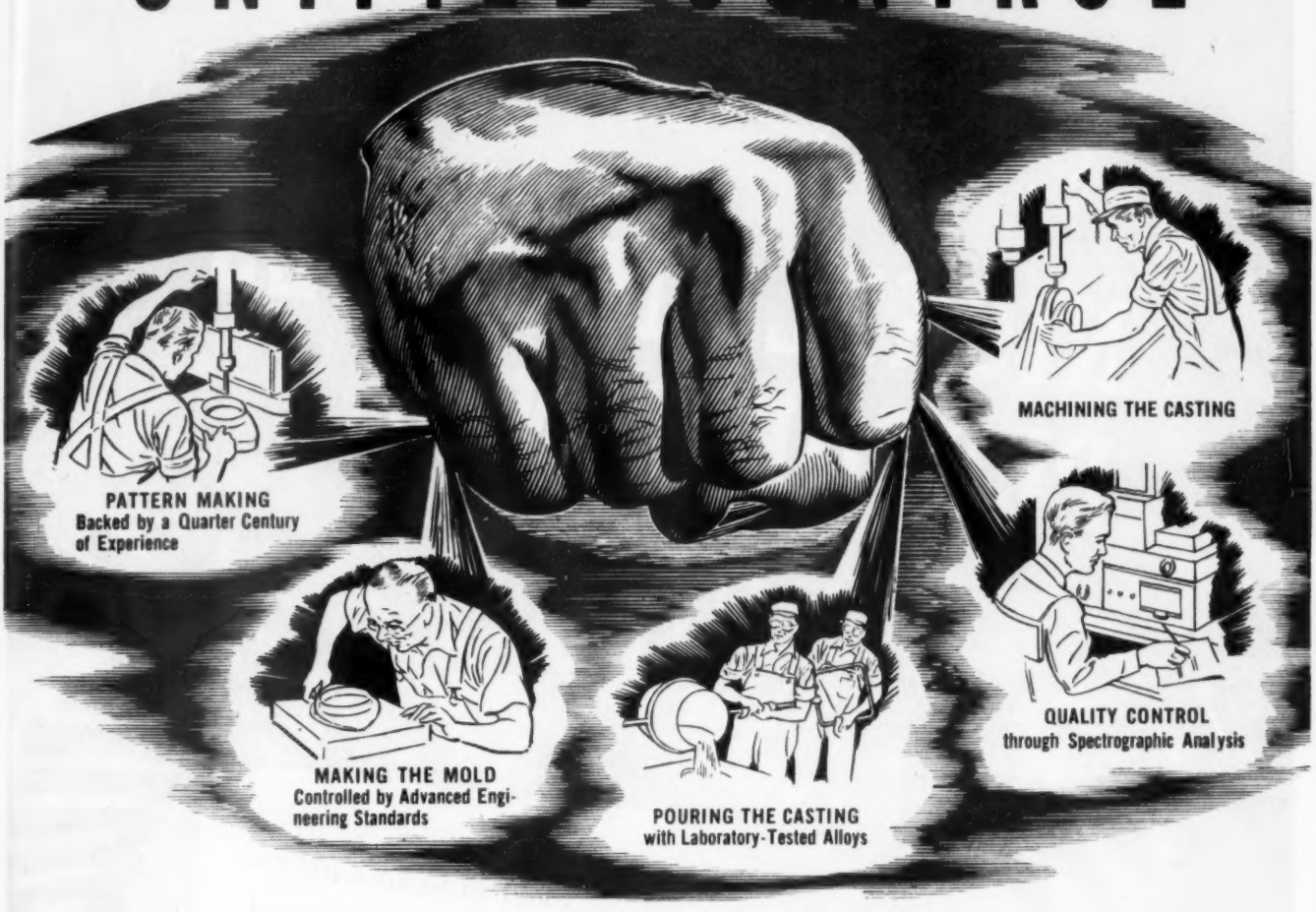

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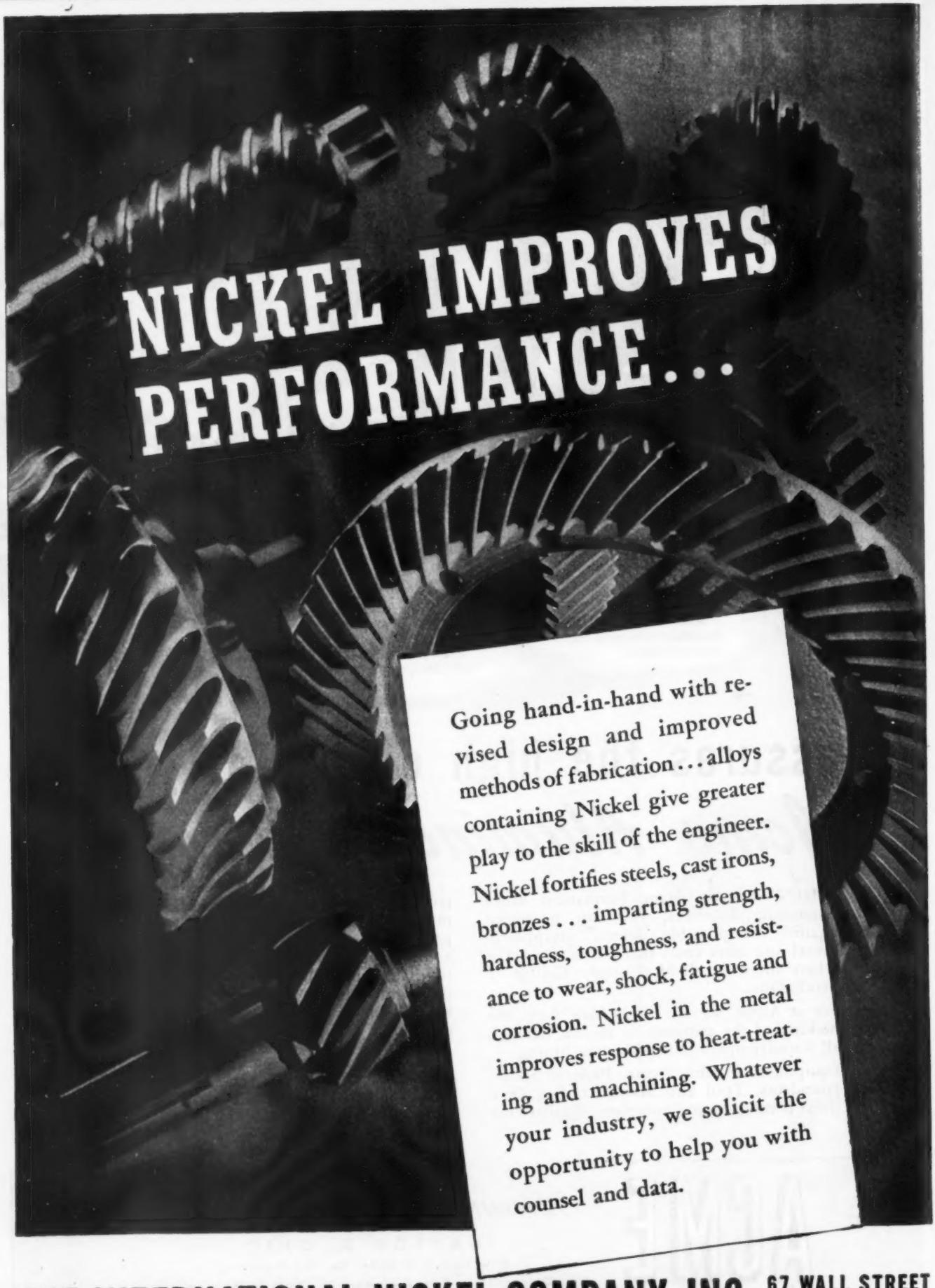
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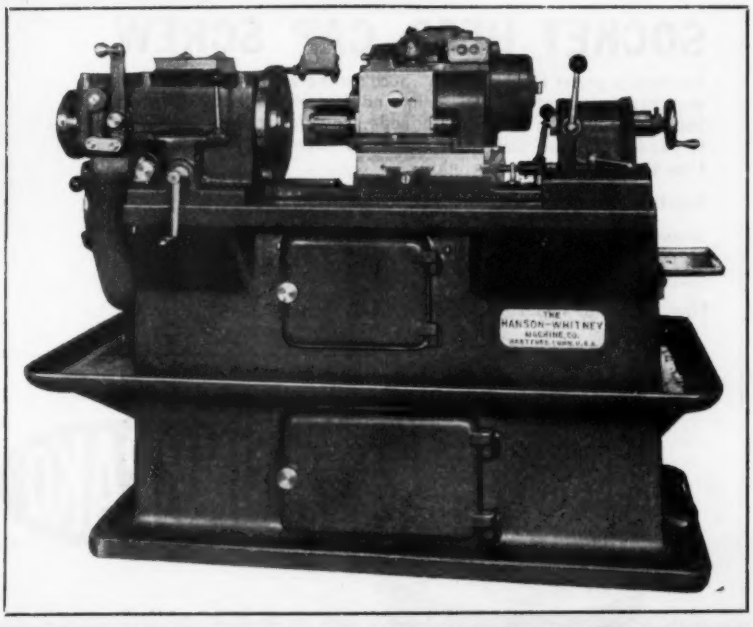

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HARTFORD CONNECTICUT USA

...The Knurled Heads

SAVE TIME

KNURLED

UNBRAKO

Reg. U. S. Pat. Off.

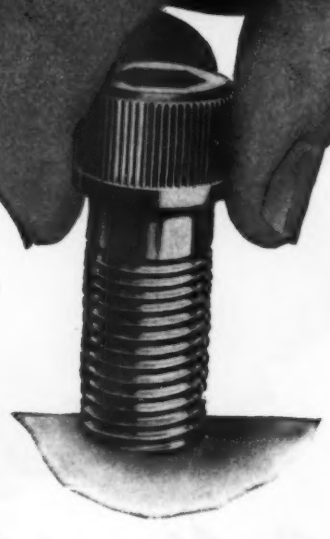
SOCKET HEAD CAP SCREW

Mechanics prefer the "Unbrako" because the knurling of the head prevents time-wasting finger-slip and lost motion. Oily fingers become geared to the knurled head, enabling the screw to be screwed-in farther and faster before a wrench is needed. The time thus saved adds up mightily.

Knurling also permits locking after countersinking.

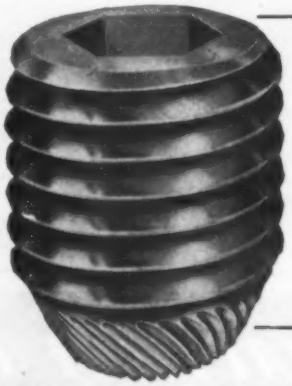
Strong, and made to very close tolerances, this unique screw can be used with confidence and satisfaction, especially where a first-class job is imperative.

Sizes from No. 4 to 1½" diameter—Full range of lengths.



Knurling of Socket Screws originated with "Unbrako" years ago.

For detailed information, send for the Catalog of "Unbrako" Socket Screw Products



UNBRAKO

Where ordinary set screws fail to hold, use the Knurled Point "Unbrako" Set Screw. The knurls of its cup-point dig in and hold tight—no amount of vibration will cause the screw to unwind. Yet it is easily removed with a wrench and may be used again and again.

Sizes from No. 4 to 1½" diameter—Full range of lengths.

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Taming 8800 Horses OVER TOKYO

Wright Cyclone Engines ...rings of Pittsburgh Steel

Upon the *complete integrity* of the two bearing shells, in each of its four 2200 H.P. Wright Cyclone Engines, depends the success of every B-29's mission over Tokyo! This *tremendous responsibility* has been safely entrusted to bearings fabricated from Pittsburgh Seamless Steel Tubing.

The mighty, surging strength of 2200 "horses" is transmitted as dynamic power through these main bearings of tubular steel. Sustaining a take-off load of 4000 pounds per square inch, or a diving load that may reach as much as 7200 p.s.i., the flawless character of the steel required is obvious. *Pittsburgh Seamless,* for bearing back purposes, combines the requisite strength with the extraordinary cleanness necessary for the successful application of the mirror-smooth silver plating of bearing surfaces.

Over Tokyo, or in the less spectacular but equally exacting applications of industry, the *quality* of *Pittsburgh Seamless* can be counted on to do the job.

PITTSBURGH STEEL COMPANY
1651 Grant Building · Pittsburgh, Pa.

A typical main bearing, removed from its master rod, is shown at left. The entire horse power load from 2 sets of 9 radial cylinders is sustained by two such bearings.

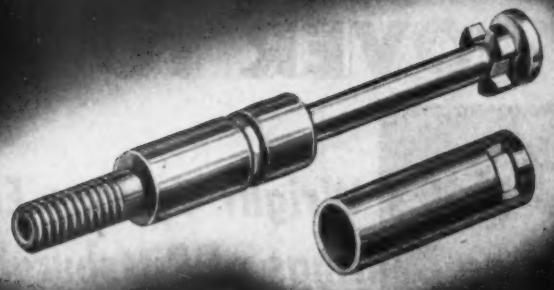
PITTSBURGH SEAMLESS STEEL TUBING
CARBON, ALLOY, STAINLESS STEEL

ONLY THE BEST IN STEEL IS GOOD ENOUGH TO FLY

The heart of the Boeing B-29 Super-Fortress is its four 2200 H.P. Wright Cyclone 18 Engines, one of which is illustrated at right. Another famous Wright Engine, The Cyclone 9, uses a Pittsburgh steel bearing in its single radial design.

SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT



will replace -

C 1117	B 1113
C 1118	C 1019
B 1112	C 1115

and it will machine at 230 to 250 SFPM while increasing tool life 2 to 5 times. It will give you ductility equal to C1019 with tensile strength greater than C1117. When carburized, warpage is minimum and it machines with better finish than comparable steels.

SPEED CASE STEEL will increase your production from 40% to 80% and it is saving users up to $70 per ton used.

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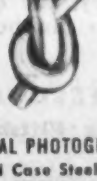

ACTUAL PHOTOGRAPH
Speed Case Steel (.20 carbon) 1-inch cold drawn bar tied in a knot, cold, without fracture.

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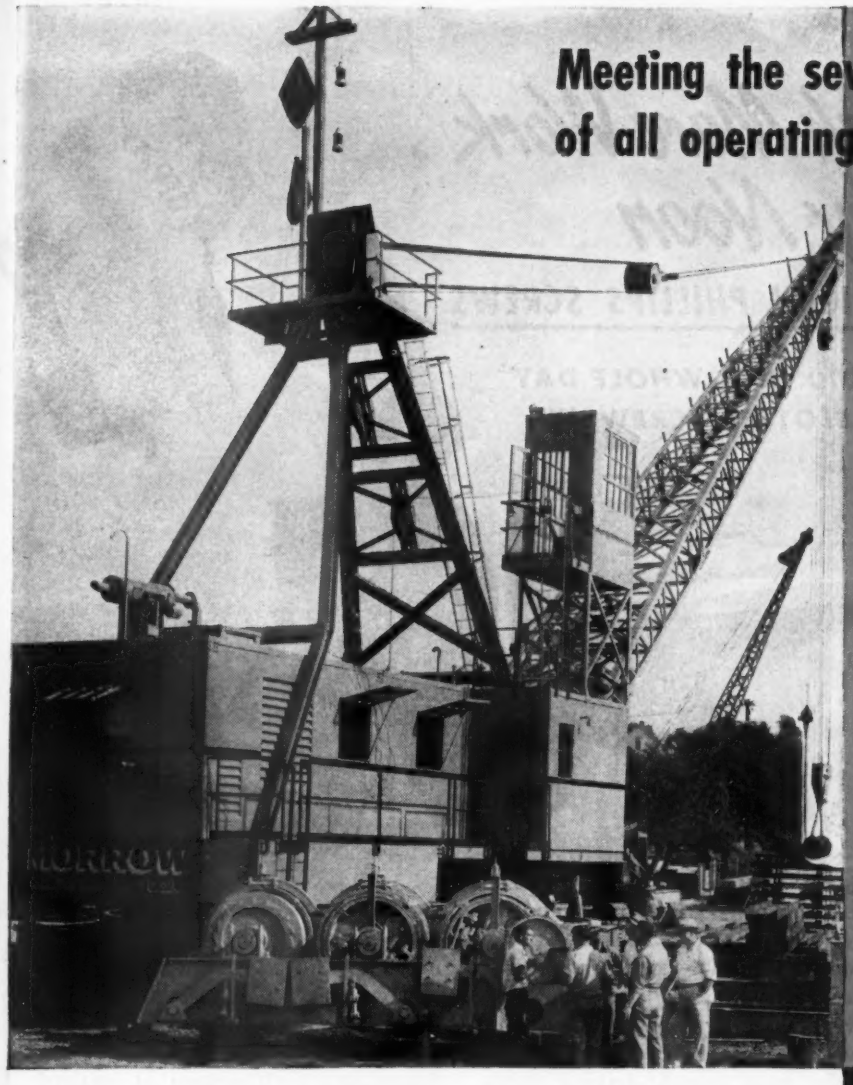

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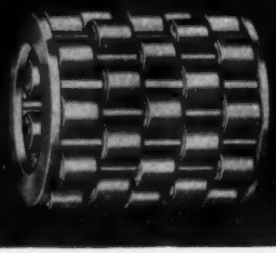
30-TON MORROW CRANES

These giant 30-ton Cranes were built by the Morrow Mfg. Co., for the U. S. Army Transportation Corps. Specifications required a test at 25% overload, which was easily met by the Cranes and by the twenty-five Orange Staggered Roller Bearings used in the operating sheaves of each Crane. All Cranes are undergoing severe service in foreign lands.

ORANGE "STAGGERED" ROLLER BEARINGS



Frankly, Orange Staggered Roller Bearings are "too good" for many conventional applications. But where loads are extremely heavy—where operating conditions are unusually severe—or where even, precision running is absolutely essential, Orange Stagger Roller Bearings serve at their best.

Because of their exclusive design, Orange Staggered Roller Bearings have much higher load carrying capacity—do the work of larger size conventional bearings. Thus, you can carry the required load with smaller bearings where space is limited. Or, use them equal size for ample overload capacity and extra life hours expectancy.

The advantages of Orange Staggered Roller Bearings may be had in a full range of standard, **Interchangeable** sizes. Special sizes made to order. Meanwhile, send the coupon for detailed Engineering Data Book, showing design, sizes, capacities, installation data, etc.

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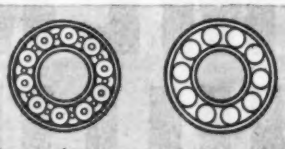
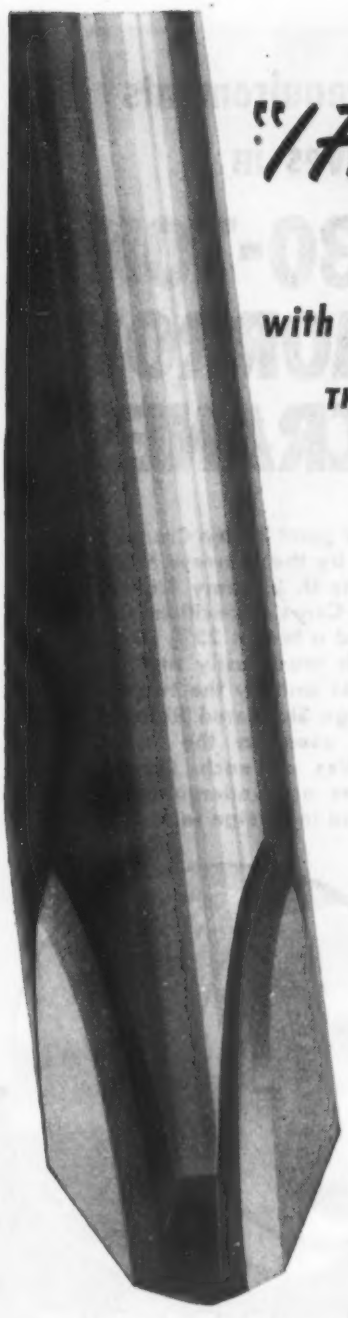


Shown above are end views of an Orange Staggered Roller Bearing and a conventional roller bearing. Note how staggered roller design provides a multiplicity of contact points within the loaded zone.



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THAN I DID IN A WHOLE DAY WITH SLOTTED SCREWS!"

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Kropp forgings embody the highest obtainable fatigue resistance; in fact, every step in proper production procedure adds something to a forging's service life. The fibrous grain structure of forgings is originated when the bar, or bloom, is rolled at the mill and the forging process further compresses the fibers into a dense mass of reserve strength, which is retained to a high degree even after long service accompanied by repeated shock and stress.

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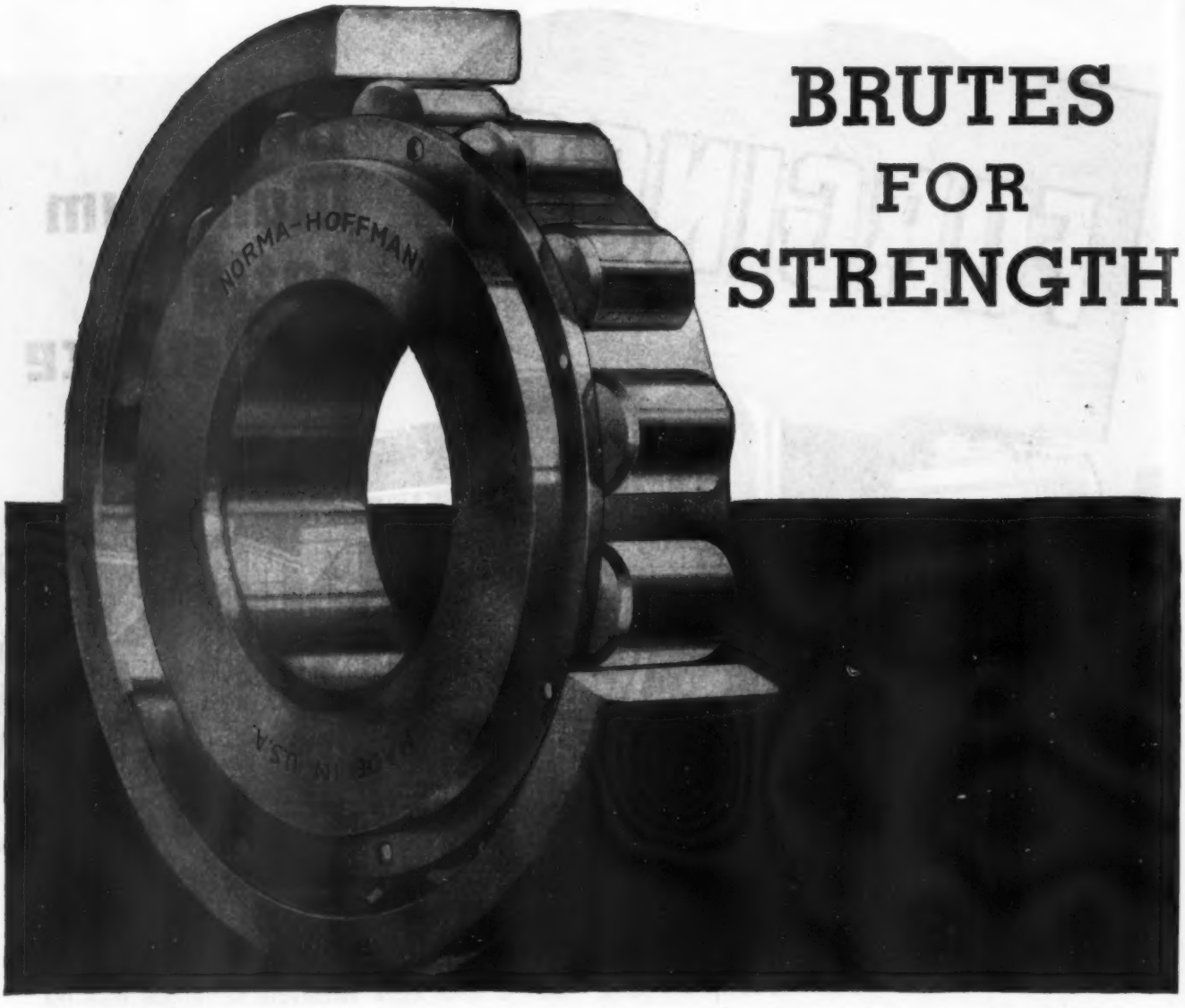

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Test these PRECISION ROLLER BEARINGS in your own hardest service; remember that they have all the high speed qualities of the best ball bearings, and are interchangeable, size for size, with all single-row metric ball bearings.

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Before you pick any motor to power your postwar product we'd like to submit 3 teasers . . .

(". . . and I know 'em all!")

Why did a famous maker of Materials Handling Equipment* not long ago say — "There isn't a Brake Motor built that can touch that Star, and I know 'em all"?

(". . . you like 'em tough")

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(**Name on request*)

We needn't tell you that buyers like these three are motor-wise, and hard-boiled in their determination to obtain the most satisfactory solution to powering their products. . . .

And we needn't tell you that we have engineering brains second to none, or that we have excellent production facilities. Without them, we could not get to first base. . . .

What, then, is the "something extra on the ball" we *must* have to lead such concerns to choose to work with Star on their new products?

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That's why you, too, will choose wisely by making Star your postwar "Motor Department". Our designing facilities can be placed at your command NOW, to solve any problems not covered by standard Star Motors, from ⅛ to 200 HP, some of which are available for early delivery. Star Electric Motor Co., 200 Bloomfield Ave., Bloomfield, N. J.

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Uniform

Have you ever watched the production line in a modern industry? Did you note the ease and the speed with which the motive units were assembled? The factor that makes this possible is the uniformity of parts. In mass production, like parts must be interchangeable.

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This close attention to detail on our part saves manufacturers considerable money plus many precious hours of assembly time. Isn't this the type of bearing service you require? Why not call us in today?

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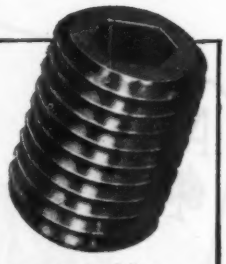
Mullins can PRESS it from Metal Instead

When you're in a TIGHT spot...specify *Mac-its*



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Mac-it products include Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs.
All are made of alloy steel and heat-treated.

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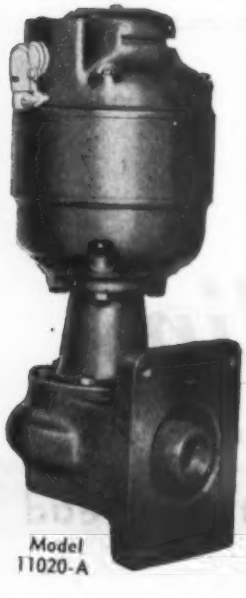

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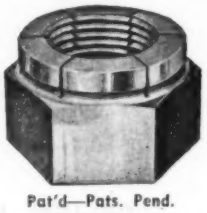

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- **Its construction is especially advantageous for maximum strength and dependability of low and thin nuts**
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Sizes from No. 6 to 1" diameter
MILLIONS IN USE
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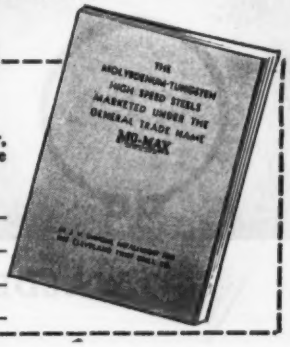
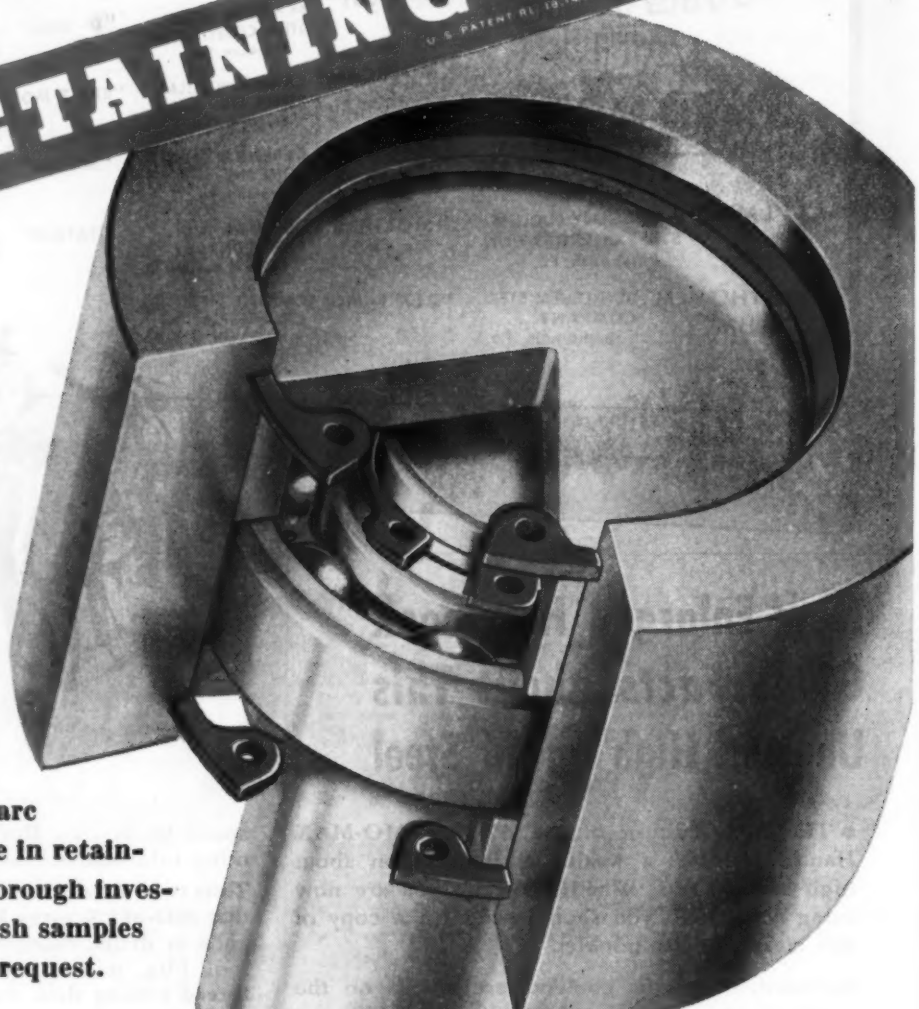
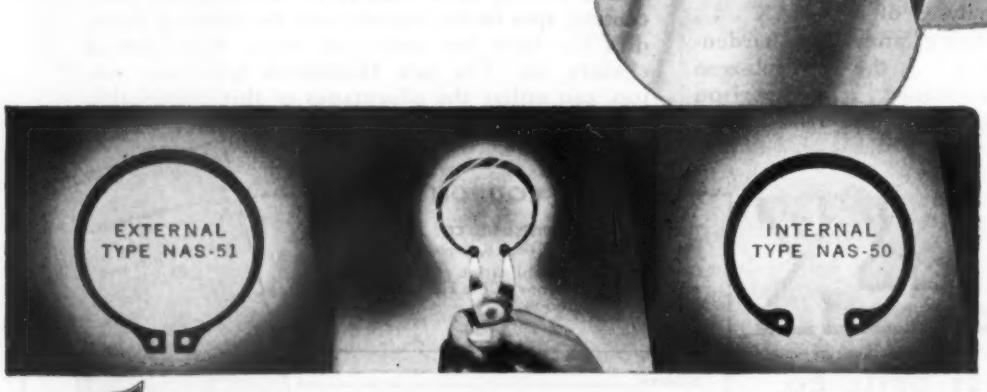


WALDES TRUARC RETAINING RINGS

U. S. PATENT RE 19,144



Waldes Truarc expands or contracts without distortion and without permanent set, fitting tight all around the groove. It offers important advantages over shoulders, nuts, collars, etc., for all thrust-load fixings in shaft and housing applications. It saves space, weight, assembly time and machining costs. Waldes Truarc presents a significant advance in retaining rings, well worth your thorough investigation. We will gladly furnish samples and full data for tests, upon request.



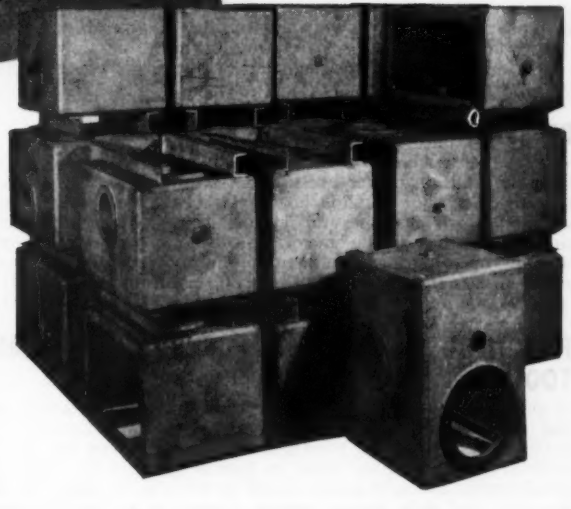
● Internal type National Aircraft Standard 50.

● External type National Aircraft Standard 51.

WALDES KOHINOOR, INC. Long Island City 1, N. Y.

Canadian Representatives: Pronco Progress & Engineering Corp., Ltd., 72-74 Stafford St., Toronto

AN IMPORTANT OPERATION



MATTISON PRECISION GRINDING

Mattison Precision Grinding is a very important operation in processing parts for war contracts at Rockford Machine Tool Co., as well as in manufacturing Rockford Hy-Draulic machine tools.

On welded steel gear boxes for ammunition hoists, the Mattison Grinder shown above demonstrated its precision and high productive capacity in finishing the bottom, the edges of the open side and bosses on two other sides. Processed in lots of 50, set up two at a time, these boxes were Mattison-ground in 1.94 hours each, floor to floor, 'round the clock.

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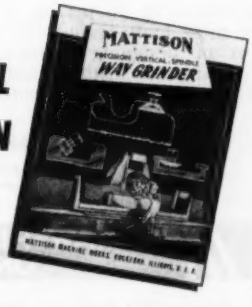
ADDITIONAL INFORMATION



Also available is free SET-UP Book showing further examples of work ground on Mattison Grinders. Send for copy today.

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written for you by an expert

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A practical toolroom engineer brings you in this new book the gist of his *40 years' experience* in interchangeable manufacture. Here are drawings and photographs with detailed explanatory text of 90 percent of all the key designs used in tools for presswork. Includes all the necessary mathematical formulas for laying out the assembled dies in a clearly rendered drafting technique — shows dies for producing war equipment that reveal basic principles of many key designs that will have wide application in fabricating an endless variety of small precision parts after the war—shows you the drafting shortcuts that war production has worked out. *497 pages, 466 illustrations, $5.00.*

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A practical manual on computing, drafting, and designing of drilling jigs, gages, hand tools, tapping and milling fixtures. Features a clear presentation of principles of design, shown by the unusual method of illustrating them in typical designs for jigs, fixtures, attachments, and accessories useful in drilling, milling, and tapping practice, and then giving concise discussion of the important elements and utility of these designs. In this way the reader will get a review of 90 percent of the principles involved in the design of these tools—principles that can be applied in an infinite number of designing problems. Numerous suggestions on drafting, formulas and mathematical helps for the draftsman, etc., are given. *171 pages, 184 illustrations, $2.50.*

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For Greater Drill Press Output

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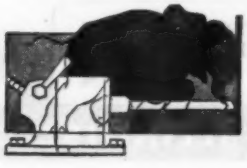

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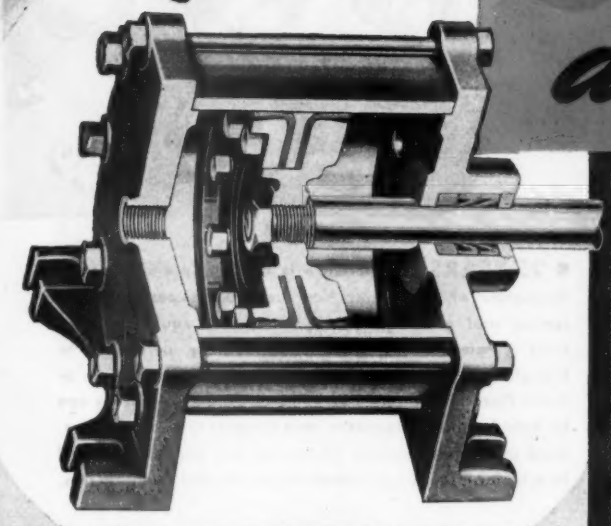

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FOR • PUSHING • PULLING • LIFTING HOLDING and OTHER APPLICATIONS

These Logan Features Assure Peak Performance and Long Life

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- Maximum power without leakage assured by molded composition packing cups, self-adjusted by air.
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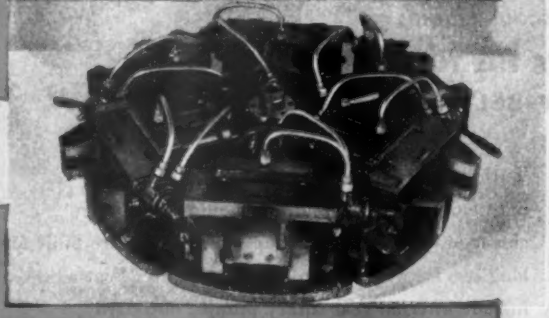
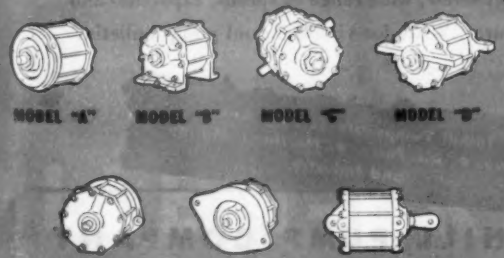


LOGAN AIR CYLINDERS ARE AVAILABLE IN 7 STANDARD MOUNTING TYPES



To get fast-acting, convenient power for pushing, pulling, lifting and holding operations, replace inefficient hand actuation with *standard* LOGAN Air Cylinders. Many profitable advantages can be obtained that will increase production in industrial applications of all kinds.

The constant power with follow-up assures positive, uniform actuation. Control valves may be located at any convenient point, adjacent or remote. Important savings in operator time and fatigue will result. In addition, the use of LOGAN Air Cylinders often permits simplifying the design of a mechanical structure and reducing amount of floor space required.

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Write for recommendations on the proper cylinders for your applications and most effective methods of installation. No obligation.

USE COMPLETE LOGAN AIR EQUIPMENT...

For highest efficiency, use Logan equipment throughout in your complete air installations. Logan cylinders, control valves and air accessories are designed to work together as a balanced air system.

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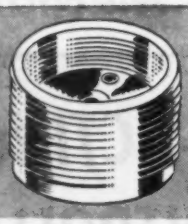
Any size... to



type...

length.....
strength....

metal...

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- Specific problems requiring special screw machine products are welcomed.

WALTHAM SCREW COMPANY
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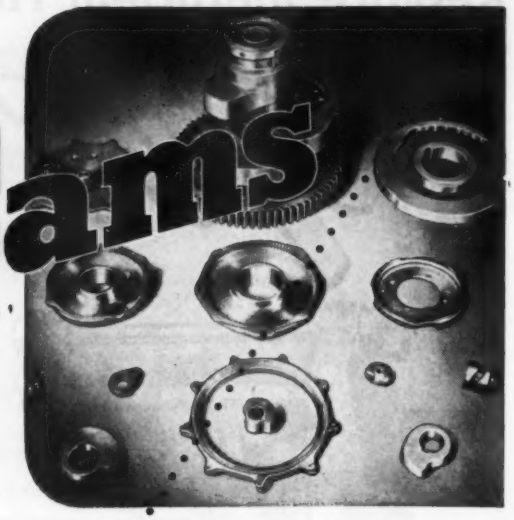
Cams



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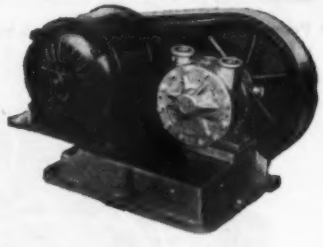
For Handling Viscous Liquids...
IT'S THE TUTHILL V-BELT UNIT



Tuthill compact V-belt pumping units make light work of handling heavy liquids. Simple in construction and quiet in operation, they are built for long service with negligible maintenance. Features include internal-gear rotary pumps, outboard ball-bearing shaft support, belt tension adjustment by one set screw, wide range of speeds, capacities and pressures. Write for viscous liquid pump bulletin.

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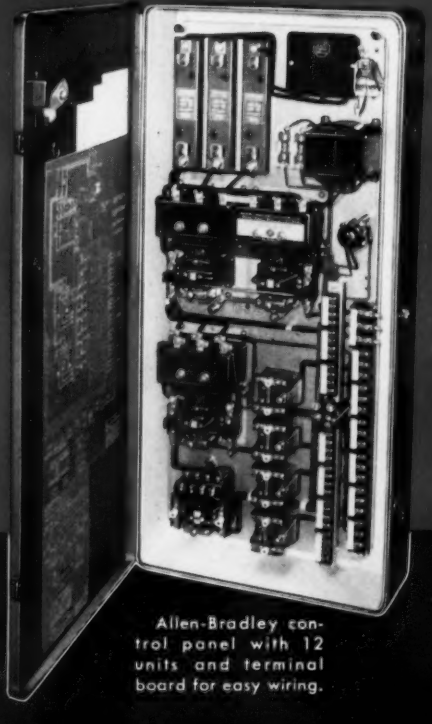
ANOTHER SHIPMENT of MODERN TOOLS

equipped with Allen-Bradley Special Control Panels

THIS shipment of Snyder profile milling machines shows how leading machinery manufacturers are standardizing on Allen-Bradley special control panels. Today, all control units of a modern machine tool, such as contactors, relays, and disconnect units, are assembled on one panel in a neat steel cabinet. Push buttons are then mounted to be convenient for the operator, while limit switches are installed where required to govern the sequence operation of the machine.

Your machines can be streamlined . . . and performance often improved . . . with A-B special control panels. An Allen-Bradley engineer will gladly study your equipment and discuss a special panel layout to fit your needs. There is no obligation.

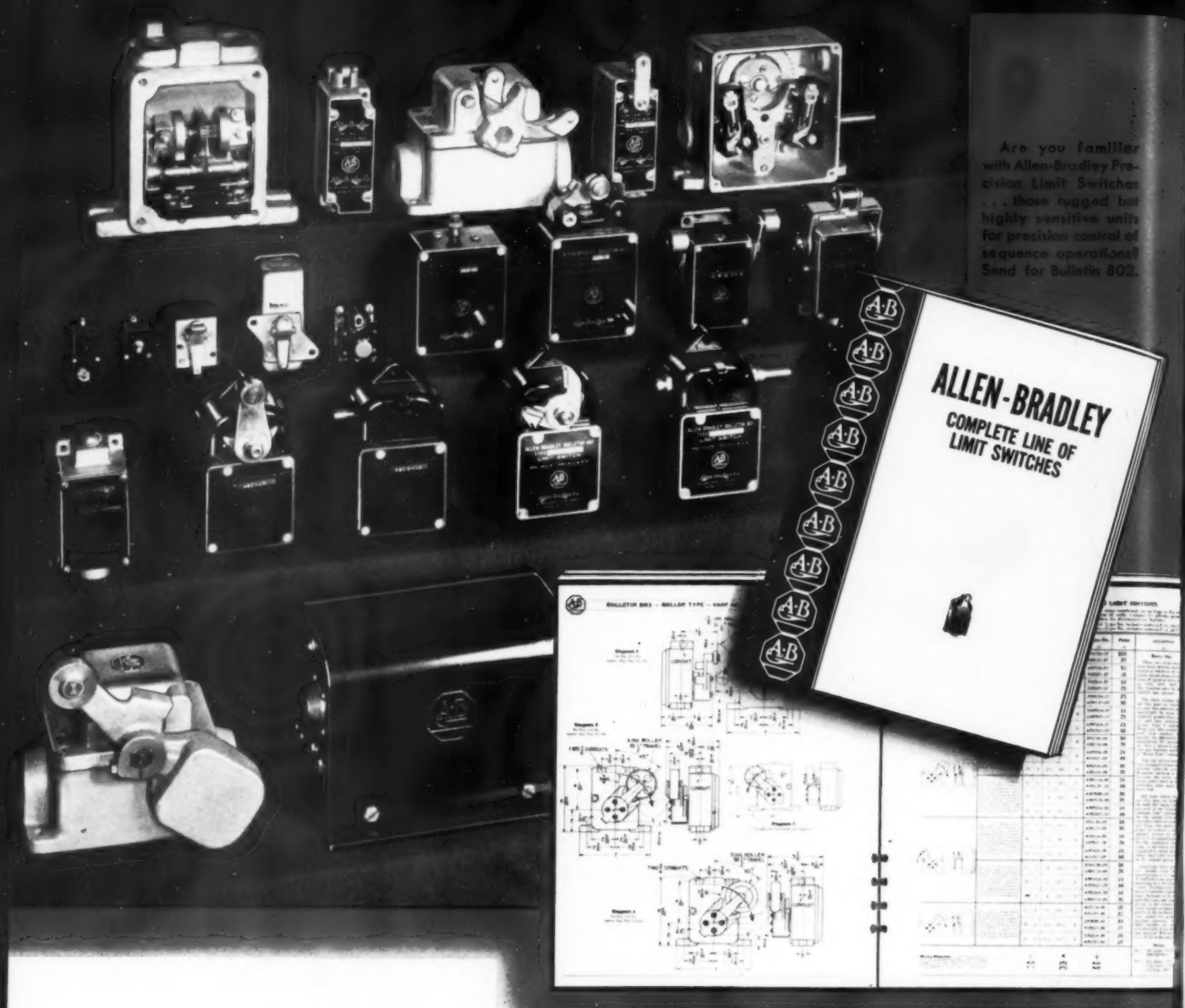


Allen-Bradley control panel with 12 units and terminal board for easy wiring.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROLS FOR ALL INDUSTRIES

QUALITY



Are you familiar with Allen-Bradley Precision Limit Switches . . . those rugged but highly sensitive units for precision control of sequence operations? Send for Bulletin 802.

Is your File up-to-date on Limit Switch Developments?

Limit switches are so important in automatic motor control that it takes 72 pages in the Allen-Bradley catalog to list all the latest developments in A-B limit switches. An additional special 24-page technical bulletin tells how and how-not to install them.

Let us send you this 96-page limit switch catalog for your file. It is full of valuable suggestions, diagrams, and pictures . . . just what every machinery engineer needs to solve unusual motor control problems. And for the tough jobs call your nearest Allen-Bradley engineer. There is no obligation.

Allen-Bradley Co., 1316 S. Second St.
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A-B

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LIMIT SWITCHES FOR EVERY SERVICE

QUALITY

NO MORE *SUNDAY WORK*

Now Worthington Compressor Engineers announce the development of new-type frame bearings and connecting rods for type DC motor-driven, type OXP duplex steam-driven, and angle gas engine driven compressors.

With pressure lubrication on most sizes, this latest refinement in compressors permits heavy-duty continuous service, without any of the Sunday maintenance work commonly required by obsolete wedge adjustable bearing designs. Also avoids expensive accidents resulting from broken wedge bolts. Save outage, man-hours, maintenance time . . . it all adds up to a big saving in operating expense.

Once again . . . as in the development of Feather* Valves, Worthington compressor engineering leads the way toward *better* compressor performance. Write for complete details . . . Publications Department, Harrison, N. J. *Worthington Pump and Machinery Corporation, Buffalo Compressor Division, Buffalo, N.Y.*

WORTHINGTON ADVANCES COMPRESSOR DESIGN

The famous Feather* Valve is another example of Worthington compressor pioneering.

TIGHTER—valve is made tight by the pressure on the thin flexible strips.

SIMPLER—no buffer plates or cushioning devices.

QUIETER, SAFER—at high speeds—light, contact seating.

LESS FRICTION—flexibility, large lift area, contact seating.

ACCESSIBLE—valve removed within five minutes.

LOWER MAINTENANCE—valve practically indestructible; intake and discharge valves identical and interchangeable.

*Reg. U. S. Pat. Off.

WORTHINGTON *BEHIND THE NAME* **WORTHINGTON**

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON

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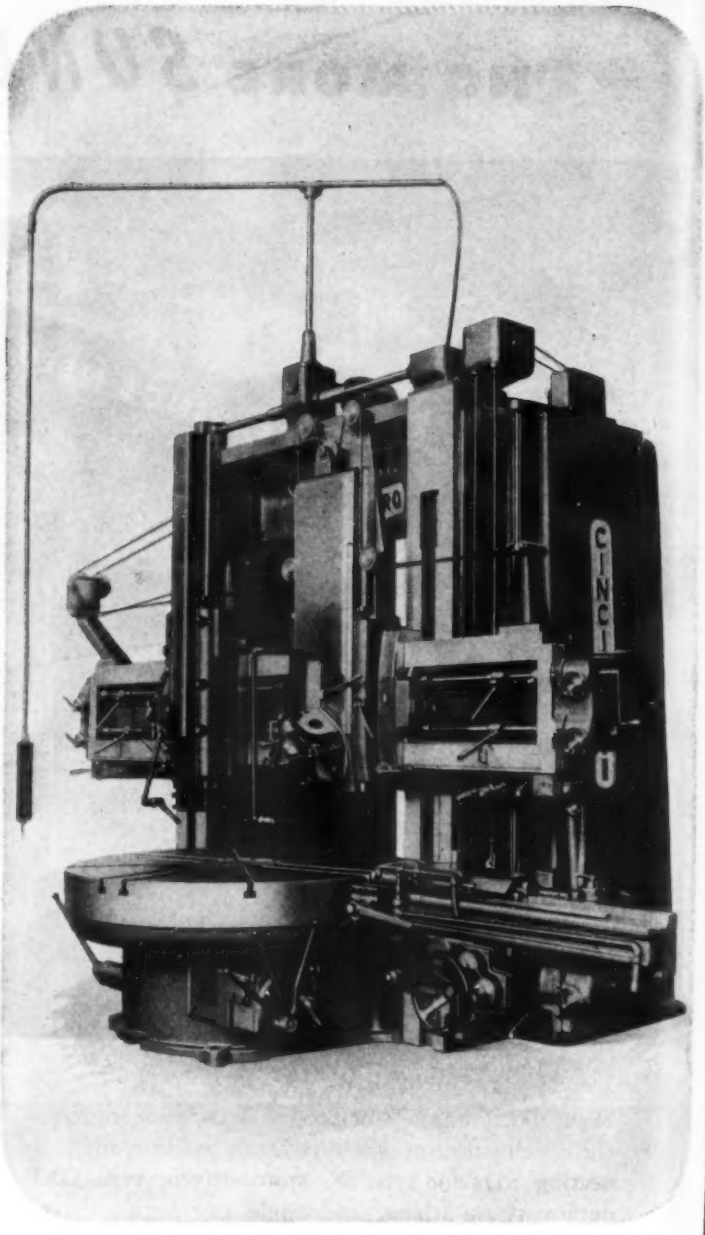
● *Built by* THE CINCINNATI PLANER CO.



Production

STAYS UP HERE

All through this 6′ or 7′ Cincinnati Hypro Vertical Boring and Turning Mill are SKF Ball and Roller Bearings. Some take combined radial and thrust loads on the feed mechanism. Others hold turning parts of the drive in correct alignment . . . insure rigidity in the table post. And *all* pay their way within a short time by keeping trouble away from the moving parts that keep production UP . . . by never needing adjustments . . . by radically reducing maintenance costs. On a big machine like this, a manufacturer cannot afford to take chances with bearings. And SKF puts the right bearing in the right place . . . *always*.

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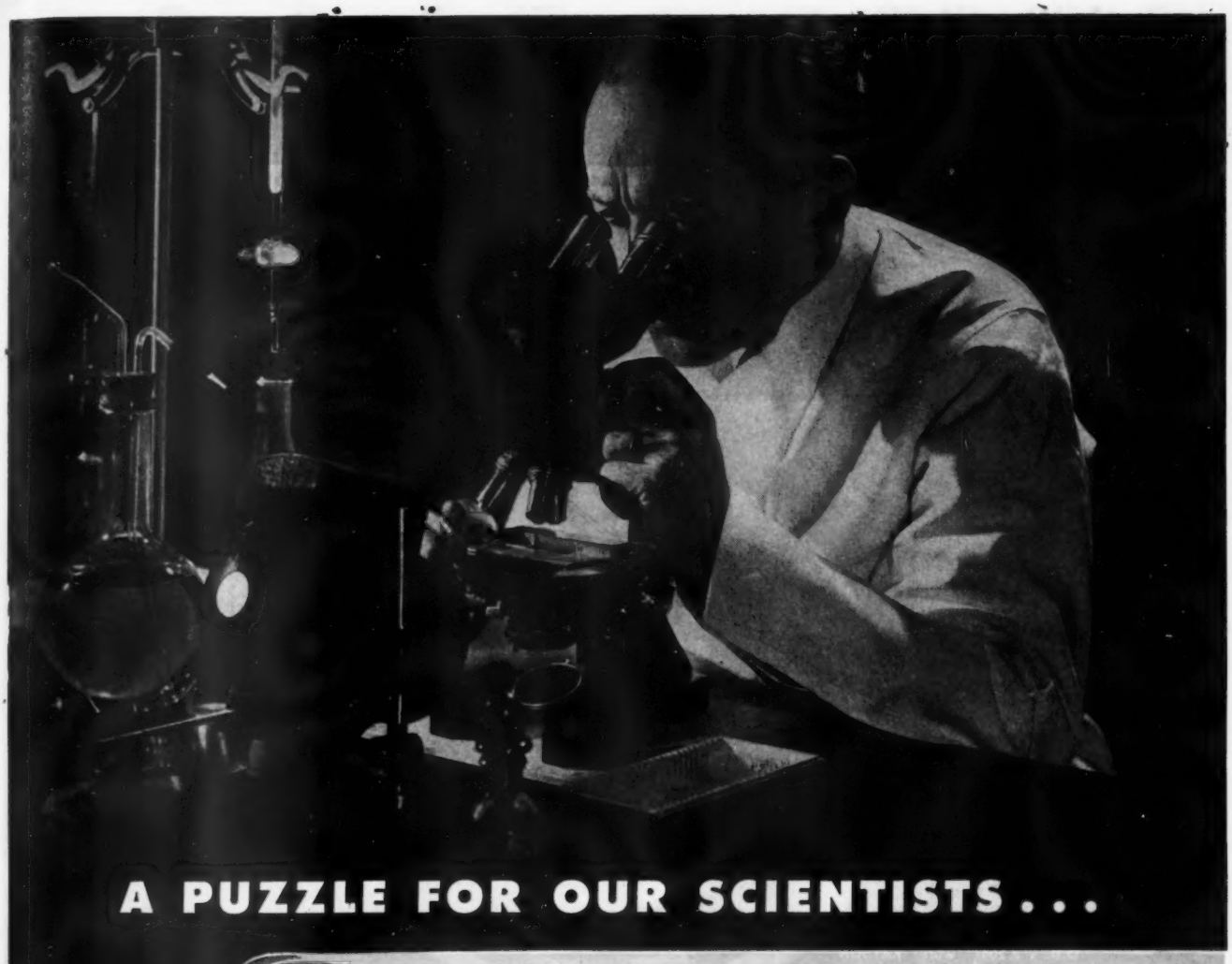
BALL AND ROLLER BEARINGS



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Solving Problems for Industry

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FIRE-RESISTANT HOSE ASSEMBLIES

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HOW TO SAVE YOU A PENNY

HAVE you thought much about performance of small parts in new peacetime products—and how much these parts cost?

Countless times since 1919 Weatherhead has been assigned the job of saving "a penny a part" for a manufacturer—and has solved the puzzle and delivered a finer part in the bargain. At Weatherhead this kind of thinking begins at the beginning—in the laboratory—where a steadily growing staff is trained to consider engineering, production and marketing factors all as interlocking parts of each job at hand.

One of many examples:—When hydraulic brakes were adopted for the automobile, Weatherhead developed a hydraulic brake line only one-half the size of those previously used, and produced it for less cost to the automotive industry.

That's why we can say, "Look ahead with Weatherhead." We invite you to write our Sales Engineering Department for assistance in solving your postwar parts problems now.

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FOR ALL TYPES OF BALL AND ROLLER BEARINGS 4" BORE TO 120" OUTSIDE DIAMETER

The LVT-A2 "Water Buffalo" amphibious tank, a cargo-personnel carrier and offensive weapon used continuously since Guadalcanal in the Pacific theater.
LVT 4 "Water Buffalo" equipped with rear ramp. Brings supplies when no other vehicle can do so; carries wounded back to safety.
KAYDON spherical roller bearing. 4.3307" I. D. x 7.0866" O.D. x 2.2047" wide. KAYDON Bronze or steel retainers; super-precision or standard tolerances.
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KAYDON Bearings serve the machines of the U. S. Armed Forces in many ways, on many fronts. **KAYDON** is proud of its part in speeding victory.

Specializing in the production of all types and sizes of ball and roller bearings in diameters up to 120", **KAYDON** offers a service that banishes the need for compromising on a "standard" bearing that does not fill your exact needs.

In addition, **KAYDON** offers atmospheric control in heat-treating, rarely provided by special bearing manufacturers; flame hardening, precision heat-treating, metallurgical laboratories, microscopy and physical testing.

Capacity available for production of all types and sizes of **KAYDON** Bearings.

KAYDON *Types of Standard or Special Bearings:*

Spherical Roller • Taper Roller
Ball Radial • Ball Thrust
Roller Radial • Roller Thrust

THE KAYDON ENGINEERING CORP.

MUSKEGON · MICHIGAN

New in Name . . . Old in Experience

STAND BACK, Paul Bunyan..

..Rough stuff like this takes ball bearings!

Out in the Pacific Northwest country the trees are even taller than the lumberjack's stories. Getting one of these monster Redwoods or Douglas Firs down is a job but nothing like the job of getting it up . . . and out. They have a machine out there for doing that which makes Paul's blue ox, "Babe", look like a yearling calf. It's a heavy-duty hoisting, towing rig for hooking up to the power take-off of a tractor. It'll pull up to 45,000 pounds at the rate of 79 feet a minute. And one of the features that enables this mechanical blue ox to handle several times the maximum capacity of the tractor itself is the use of large-ball, deep-groove Fafnir Ball Bearings. It takes this Fafnir "balanced design" to take this kind of rough-and-tumble shock.

If that's the kind of bearing performance you want, then you want to talk with a Fafnir Field Engineer. Write us in detail today. The Fafnir Bearing Co., New Britain, Connecticut.

★ 2196

MOST COMPLETE LINE IN AMERICA

FAFNIR BALL BEARINGS

CUTTING TOOLS

PROPER COOLANT

MACHINE TOOLS

VITAL LINK

PIONEER PUMPS

Pioneer Pumps form the final link in the machine tool cycle . . . they complete the circle that makes precision production possible.

Designed by engineers who sought long and vainly to solve their own coolant problems with equipment then existing, Pioneer Pumps found immediate acceptance. An acceptance that has mounted steadily as they proved to production men they were indeed better pumps.

Built to rigid standards, Pioneer Pumps provide an ample, flawless flow of coolant . . . they're the longest-lived pumps in existence. And the most adaptable, with 400 standard models insuring the right pump for any application.

PIONEER MODEL "VA"

This model is ideal for submerging in coolant sumps of grinding, honing, lapping, superfinishing and sanding machines—or wherever outside mounting is impossible or objectionable. Internal design, with suction from motor end down, prevents coolant surging up shaft when pump is operated intermittently or when outlet line is throttled.

PIONEER Pumps

HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

Pioneer Pump & Manufacturing Co.
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ALLEN

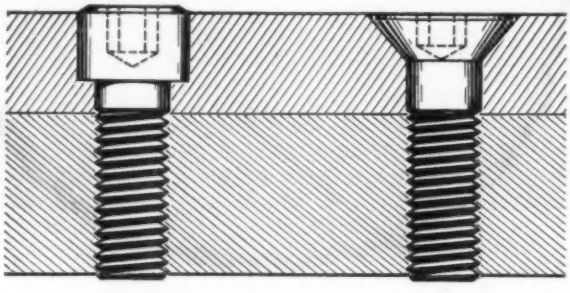
FLAT HEAD CAP SCREWS

V-head design fits counterbored hole with *no gap* between screw head and surrounding metal. This gives frictional grip and a locking rigidity, reinforced by the tightest of set-ups possible only by powerful wrenching with an Allen Hex Key.

The screws are "pressur-formd" of ALLENOY steel, with uncut metal fibres shaped to the head. Threads also are *pressur-formd*, with tolerances held to a high Class 3 fit.

ALLEN FLAT HEAD CAP SCREWS

set up *flush* in holding comparatively thin plates or superposed parts, without weakening the metal with deep countersink.



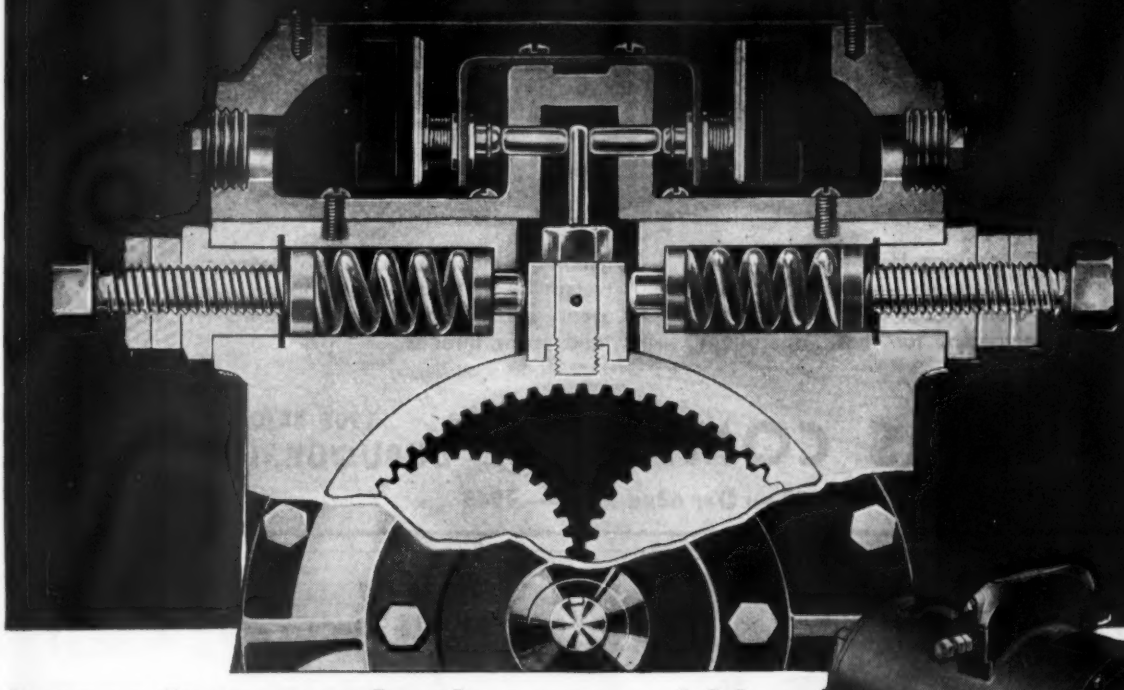
Above diagram shows how flush surface is achieved with shallow countersink as compared with ordinary socket head cap screw. Note more binding surface under the head than is had with a fillister or cheese-head type. The angle helps lock screw in place by drawing down on a conical surface.

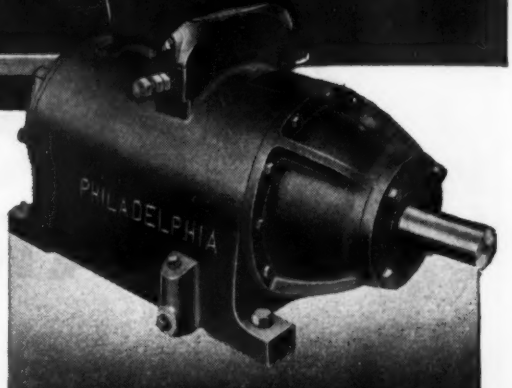
Your local Industrial Distributor supplies also Allen Socket Head Cap Screws, Hollow Set Screws, "Tru-Ground" Shoulder Screws and "Tru-Ground" Dowel Pins. Ask him for samples and details.

THE ALLEN MFG. COMPANY
HARTFORD, ★ ALLEN ★ CONN.

Instantaneous

OVERLOAD PROTECTION





Responds to overloads more quickly than electrical thermal relays

The PlaneTorque is a feature that can be incorporated into any MotoReduceR—*the built-in motor and speed reducer*—to protect both the driven machinery and the drive unit from overloads.

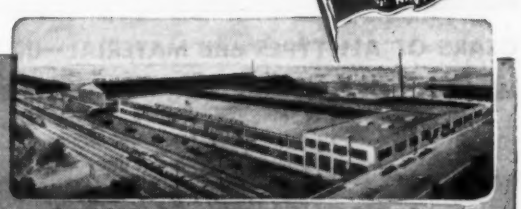
By direct mechanical action of the overload, motor current is automatically and instantly cut off when a pre-determined limit is reached. This action is quicker than electrical thermal relays provide. With fuse protection the fuses must be selected to carry the starting current of the motor. Therefore the protection during the running period is not adequate.

The PlaneTorque can be cut out during the starting period merely by holding down the starting button but will become operative during the running period when the button is released.

To restart the PlaneTorque-MotoReduceR after overload cut-off only removal of the excessive load is necessary . . . a big time saving feature.

For applications such as stoker drives, conveyor drives, mixers, roll drives, etc. . . . investigate the PlaneTorque MotoReduceR. Get our Catalog M. R. 45 for further details.

Philadelphia
PLANETORQUE
MOTOREDUCER



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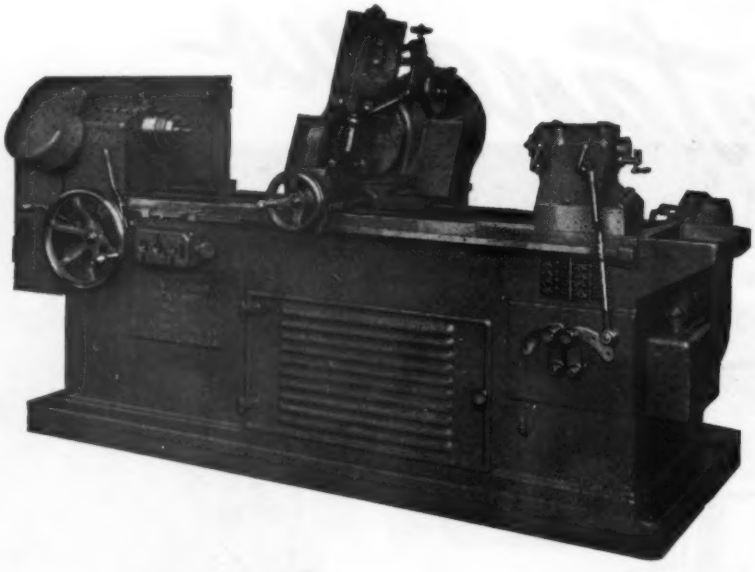
GEAR WORKS INCORPORATED
ERIE AVE. AND G ST., PHILADELPHIA 34, PA. NEW YORK • PITTSBURGH • CHICAGO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls



The ADAMS Gear Hobber and Thread Miller

The Adams Manufacturing Hobber is available when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the purchase of equipment for these operations only.

Here is a machine that combines precision with versatility. It hobs multiple splined shafts, spur gears and helical gears, and it will mill worm and screw threads.

THE ADAMS COMPANY
1905 BRIDGE STREET
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WE RECOMMEND ZEROL GEARS FOR SMOOTHER QUIETER OPERATION WHEN STRAIGHT BEVEL GEARS ARE CONVENTIONALLY USED

GEARS OF ALL TYPES and MATERIAL—UP TO 36"
MADE *Exactly* TO YOUR SPECIFICATIONS

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- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
- ★ WORM
- ★ SPECIAL

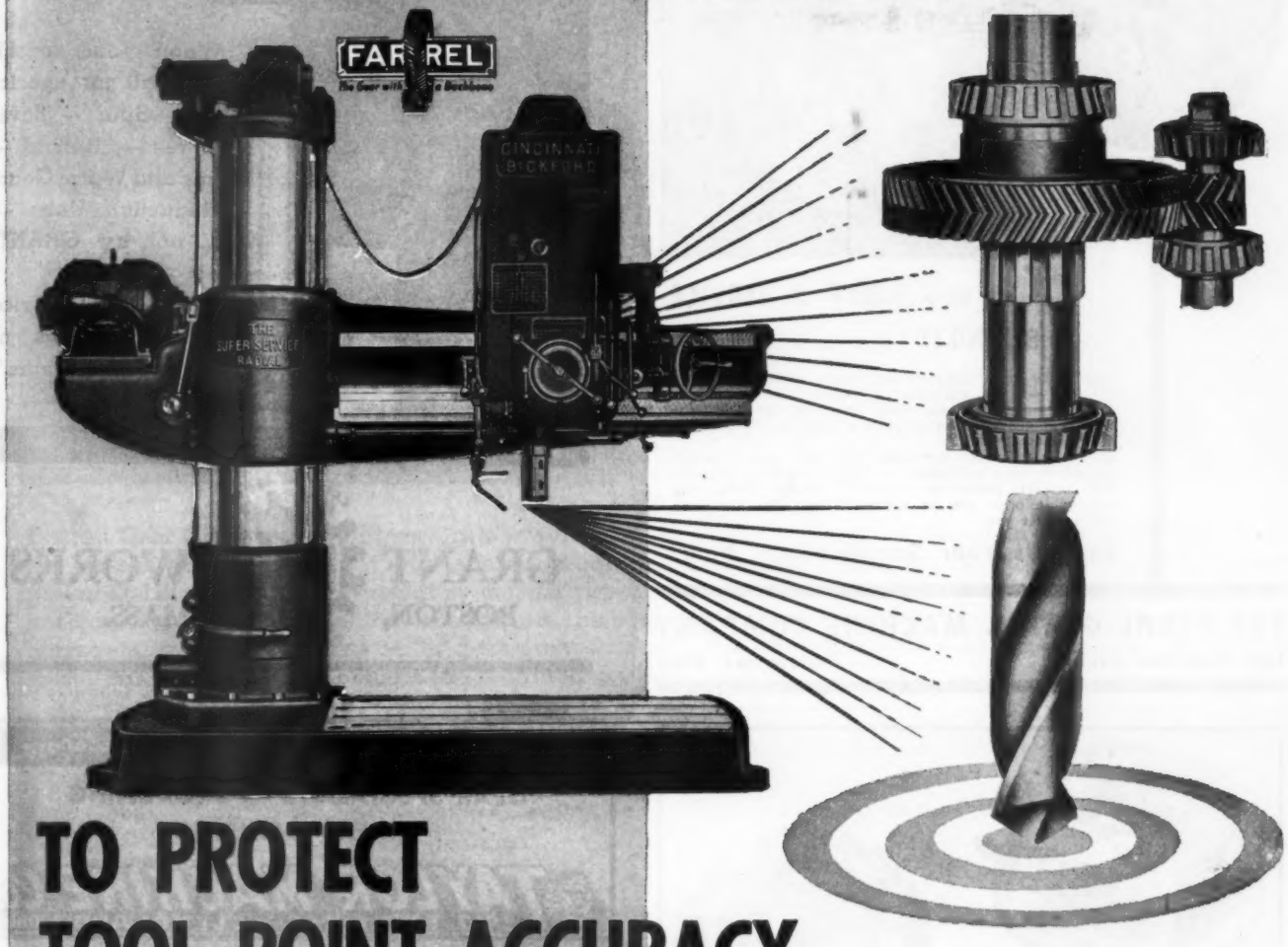
Follow the leaders . . . for they know the way! *Cincinnati Gears, Good Gears Only* are the choice of industry wherever outstanding performance is important.

Cincinnati precision made gears have the built-in strength, stamina, accuracy . . . everything, that long range performance must have to lower costs and increase profits. Remember, each Cincinnati Gear is made for your particular job . . . from your specifications.

We are ever ready to work with you in solving your gear problems.

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Marlemont Ave. ★ Cincinnati 27, Ohio

THEY SPECIFY "THE GEAR WITH A BACKBONE"



TO PROTECT TOOL POINT ACCURACY

In Cincinnati-Bickford Super Service Radials, Farrel-Sykes continuous tooth herringbone gears—the famous *Gear with a Backbone*—are used to transmit a smooth constant flow of power to the drill spindle.

Backbone, the place where the helices meet in sharp "V's" to form continuous teeth, provides greater strength and load-carrying capacity in minimum space. Gradual tooth engagement, with several teeth in various stages of mesh simultaneously, makes the power transfer smooth and continuous—eliminating vibration which could otherwise interfere with accuracy at the tool point.

Precision generation by the Farrel-Sykes method . . . accuracy of tooth contour and tooth spacing within close tolerances . . . uniform distribution of the load on each tooth and across the entire face . . . the balancing of axial thrusts by the opposed helices . . . are additional factors which assure correct tooth action and contribute to efficient operation and maintenance economy throughout a long life.

Wherever power transmission must be smooth and vibrationless under all conditions of load and speed, specify the *Gear with a Backbone.*

For information about Farrel-Sykes gears and gear units send for a copy of Catalog No. 438.

FARREL-BIRMINGHAM COMPANY, INC. • 344 VULCAN STREET, BUFFALO, NEW YORK

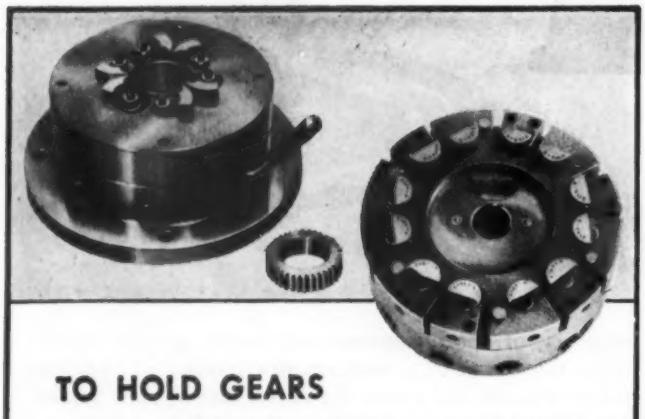
Plants: Ansonia and Derby, Conn., Buffalo, N. Y., Sales Offices: Ansonia, Buffalo, New York, Pittsburgh, Akron, Los Angeles, Tulsa, Houston

. . . and WHAT A SERVICE BEHIND IT . . . . . .

This husky gear—produced by Stahl—typifies one class of work we are equipped to handle. We're equally well set up to produce small gears to any specifications and of any material in any quantity, because we are gear specialists.
All of which means that when you need gears you are invited to take advantage of Stahl's modern, efficient and complete production facilities. Prompt service and reasonable price can be depended on. Our quotation will interest you.

Send Us Your Specifications Now!

THE STAHL GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland, Ohio



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with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION
Principle used only in
MATCH-IT GEAR CHUCKS

Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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"When your specifications call for special gears — Spur — Bevel — Mitres — Helical — Worms and Worm Gears — Reduction Units — Why not try GRANT.

You will find GRANT service meeting all requirements of both stock and special gears."

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ESTABLISHED 1877 BY GEO. B. GRANT

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GEAR SPECIALISTS — BROACHING
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New Design
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MITER GEAR UNITS

Boston Gear Standard miter gear units provide an efficient and compact means of transmitting motion at the same speed through right angles (around corners) and are furnished in sizes to convey 3/4 to 12 horsepower at 1200 R.P.M. Further, they can be supplied with the shaft projection vertically up or down or horizontally on three sides and, in addition, the base can be assembled on the unit for ceiling, side wall or horizontal mounting. These miter gear units are oil tight, they are equipped with case hardened steel spiral miter gears, and all shafts are mounted on ball bearings.

Any of the following authorized distributors and direct company branches will be pleased to give you complete specifications and prices of these Boston Gear Standard miter gear units:

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Are you set for STIFFER COMPETITION?

YOU'LL need all the satisfied customers you can get in the postwar period. Here is one way to keep customers satisfied. Build sales-winning strength and service into the things you make by installing Earle Gears. Doing so will give you more saleable products—more satisfied customers. Earle Gears are custom-cut to your specifications, sizes range from inches up to 30 feet in diameter. Write today outlining your requirements. Specify "Earle" when drawing your plans and writing your orders. The Earle Gear & Machine Co., Stenton Ave., Philadelphia 44, Pa.

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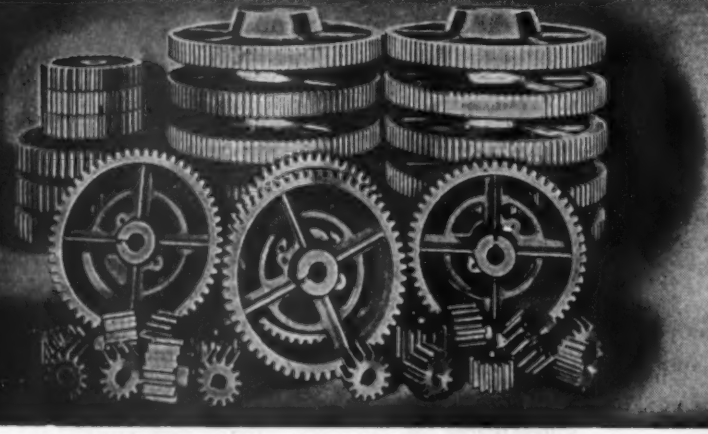

ADAMS GEARS

SPUR — HELICAL — WORM
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Splined Shafts A Specialty

THE ADAMS COMPANY
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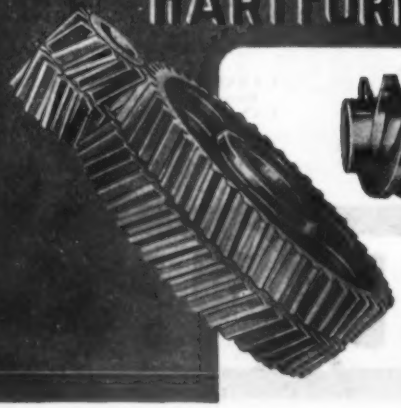
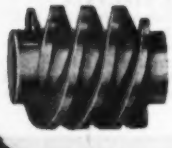
"HARTFORD" for Gears, Cams, Thread-Grinding

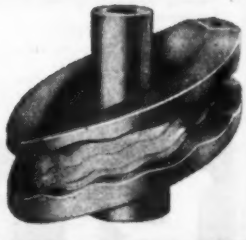




OUR SERVICE INCLUDES:

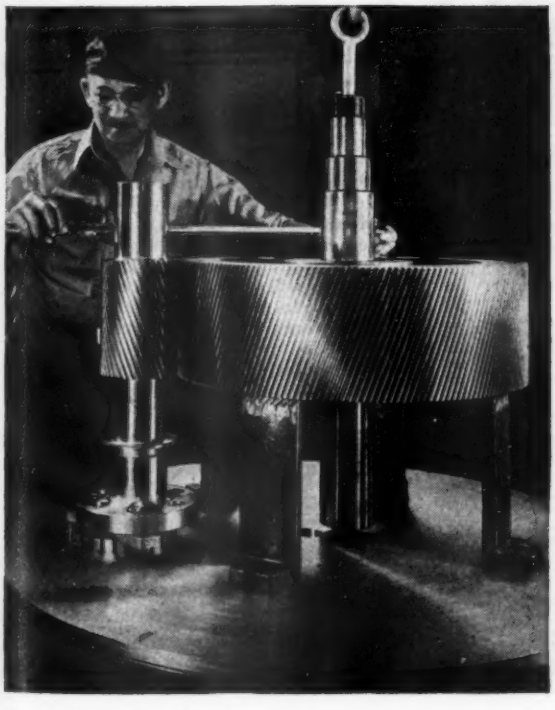
- . . . cutting gears of every description exactly to specifications
- . . . grinding gears, cams and threads
- . . . furnishing aeronautical parts on a contract basis

You plan and we execute—assuring speedy production, prompt delivery and reasonable price. Send blue prints or samples for estimate.



THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD, CONN.

Sier-Bath Gears ADHERE TO



Checking mating gears on centers, one of the many procedures followed at Sier-Bath to insure absolute accuracy.

Though mating surfaces of turbine gears may be measured in square feet, accumulated error must not exceed the smallest fraction of an inch. This precision is necessary because these gears float on a thin film of oil while they spin at the speed of sound, transmitting thousands of horsepower.

Sier-Bath meets this combination of great responsibility and extreme precision with super-accuracy in every detail. Lifetime gear specialists repeatedly check every step in cutting and heat-treating. Among their equipment are the latest machinery, instrument controlled furnaces and constantly calibrated gauges. For the finest in gears from 2" to 52" see Sier-Bath.

☆ *1945 MARKS OUR 40TH YEAR OF SERVICE* ☆

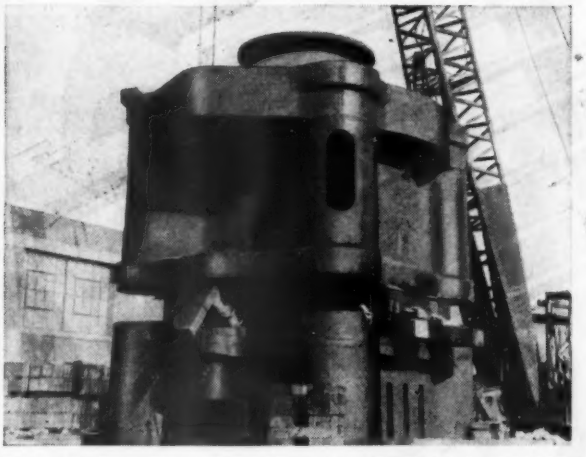
Sier-Bath Gear Co.

9240 HUDSON BOULEVARD, NORTH BERGEN, N. J.

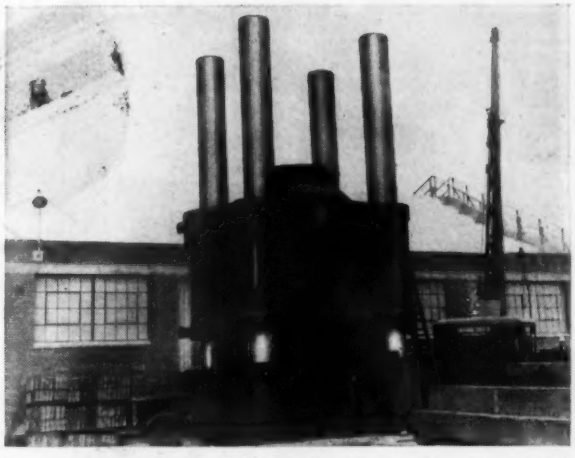
THE LARGEST PRESS

With a total weight on the foundation of 1,000,000 pounds, and a capacity of 12,000,000 pounds, this Lake Erie Hydraulic Press was installed by the Norris Stamping and Manufacturing Co., at Los Angeles, Calif., in record time. Much too large to set up in its present buildings the press was located in a lot adjacent to one of its buildings. Following completion of its erection the press was covered with a temporary protective tarpaulin covering.

IN THE INDUSTRIAL WEST



Top cylinder and moving platen in place. Weight, 355,000 pounds.



Partial assembly showing four columns in place.

First of four columns being installed —each 22 inches in diameter by 34 feet long. Weight, 12,000 pounds each.

Installation of the largest hydraulic press in the West was completed in February at the Norris Stamping and Manufacturing Co., Los Angeles.

This industrial giant with a capacity of 12,000,000 pounds was designed and built by Lake Erie Engineering Corporation.

Construction and installation work was done by Norris under the supervision of a Lake Erie engineer.

Far too large to be set up in any existing Norris building, the press was erected in an adjacent lot and put into operation stamping out ordnance material while a factory was being built around it.

Here are some interesting facts regarding this massive machine: it weighs 1,000,000 lbs. and required eight flat cars for shipment from Buffalo to Los Angeles.

When trucks were delivering the heavy castings, one inch steel plates were laid on the driveway to prevent the wheels from sinking through the asphalt into the ground beneath.

The foundation pit is fifteen feet deep with thirty foot pilings driven below the pit. The height of the press above ground is thirty-two feet and below the ground eleven feet. The tank for the hydraulic system holds 3,300 gallons of oil.

The Norris Company is to be congratulated on the speedy, efficient manner that this press was erected and placed into service to help with the nation's war effort. We at Lake Erie, believe the design and construction of this huge piece of machinery is further evidence of our ability to produce hydraulic presses that solve any intricate problem which arises in American Industry.

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

WRITE FOR BULLETINS:

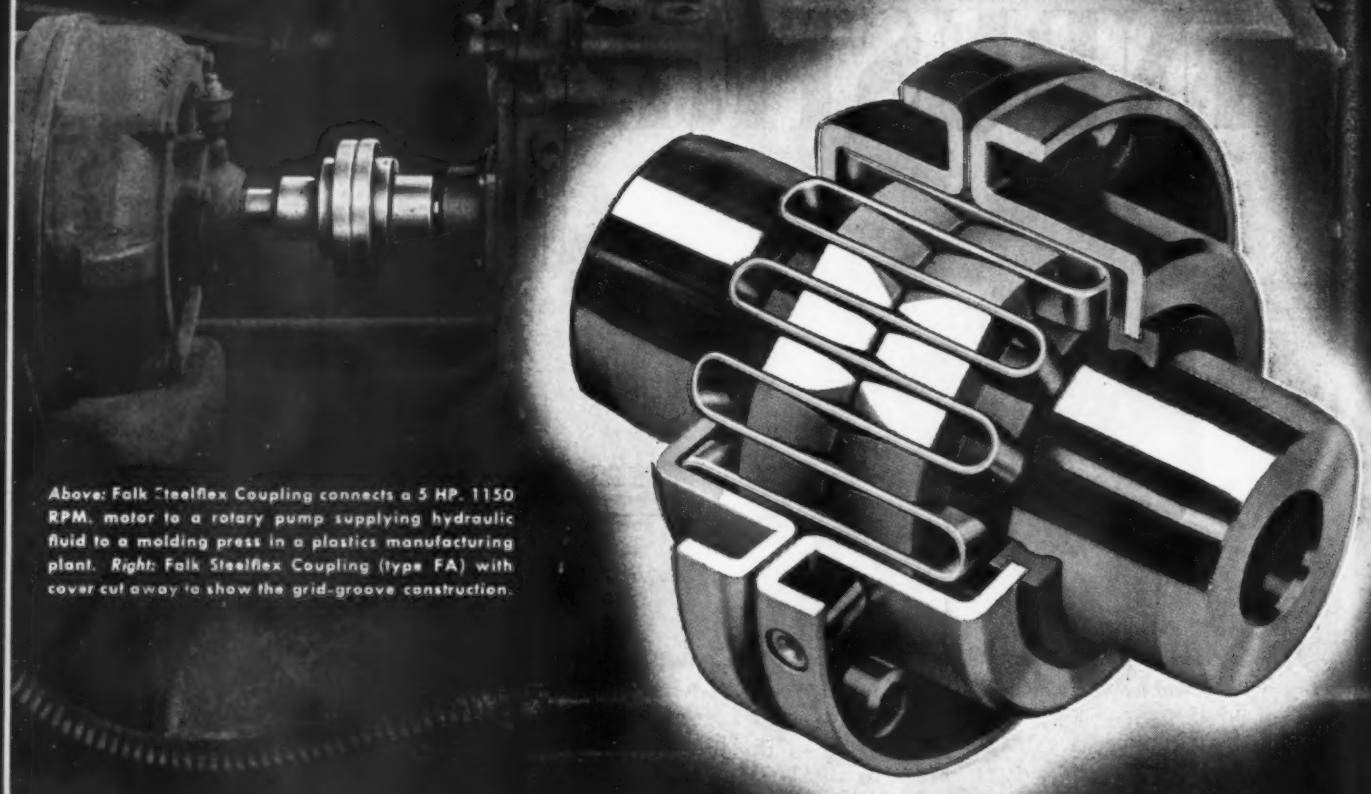
144—Lake Erie Hydraulic Presses column type.

244—Lake Erie Hydraulic Presses side housing type.

507 WOODWARD AVENUE
BUFFALO 17, N. Y.

OFFICES IN PRINCIPAL CITIES
UNITED STATES AND FOREIGN COUNTRIES

How about



Above: Falk Steelflex Coupling connects a 5 HP. 1150 RPM. motor to a rotary pump supplying hydraulic fluid to a molding press in a plastics manufacturing plant. *Right:* Falk Steelflex Coupling (type FA) with cover cut away to show the grid-groove construction.

Flexible and Resilient Grid-Groove Design Effectively Cushions Loads . . . Absorbs Shocks . . . Adjusts for Misalignment . . . Provides for End Float

FALK Engineers have long recognized the importance of, and necessity for, connecting the shafts of a driving and a driven member by a coupling that is both flexible and torsionally resilient.

As pioneers in the design and manufacture of precision gear drives, these engineers know that a coupling must be resilient to the degree that it definitely improves the character of the motion imparted to it.

This qualification extends beyond the mere connecting of shafts under slight angular and parallel misalignment without imposing undue loads on the bearings and shafts of connected machinery—which is the ordinary concept of coupling design.

In addition to providing flexibility and torsional resilience, proper coupling design dictates the use of materials that will insure years of trouble-free service.

Therefore Falk Steelflex Couplings provide both essentials of desirable coupling performance, insuring *both* flexibility and the torsionally resilient action that so effectively cushions loads, absorbs shocks, dampens vibration, adjusts for angular and parallel misalignment, and allows free end float for the shafts of driving and driven members.

How and why Falk Steelflex Couplings do all this is explained on the opposite page. Here, indeed, is a short course in efficient coupling design.

THE FALK CORPORATION, MILWAUKEE 8 WISCONSIN

For over fifty years precision manufacturers of Speed Reducers . . . Motoreducers . . . Flexible Couplings . . . Herringbone and Single Helical Gears . . . Heavy Gear Drives . . . Marine Turbine and Diesel Gear Drives and Clutches . . . Contract Welding and Machine Work. • District Offices, Representatives, or Distributors in principal cities.

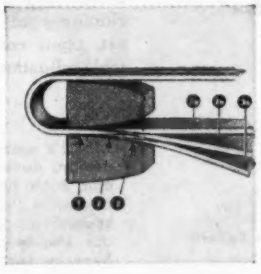
IT ALWAYS PAYS TO CONSULT **FALK**

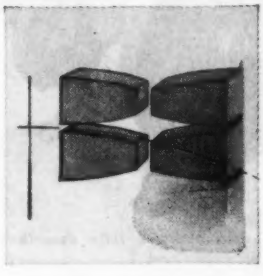
a short course in

Coupling Design?

WHY and HOW Falk Steelflex Couplings Perform Better

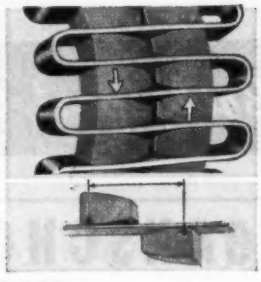
HOW THE GRID-GROOVE DESIGN FUNCTIONS. Power is transmitted through a resilient grid member made of chrome alloy steel with an elastic limit of 225,000 pounds per square inch and an ultimate strength of 250,000 pounds per square inch. This grid fits snugly into curved grooves cut into the hubs of the coupling.

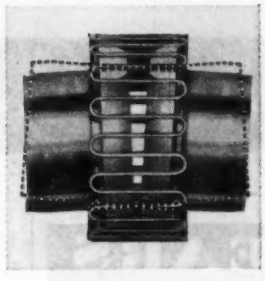




HOW THE GROOVES ARE DESIGNED. The identical hubs are moderately high carbon bar steel, forged steel, or Falk alloy cast steel. Into these hubs, grooves are cut in a precise arc, with radius and length proportional to the size of the coupling, to provide a snugly fitting slot for the grid member and a bearing surface from outer to inner edge of the hub.

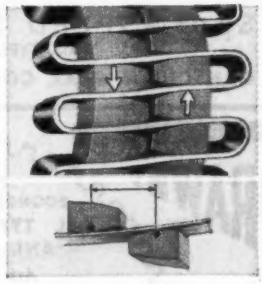
AT LIGHT LOADS, the grid member bears only at the outer edges of the curved grooves in the coupling hub, as shown at right and at *1* and *1a* in the diagram above. This permits a long, free elastic span between the outer edges of both hubs. Power is transmitted through almost the entire length of the resilient rungs of the grid member.

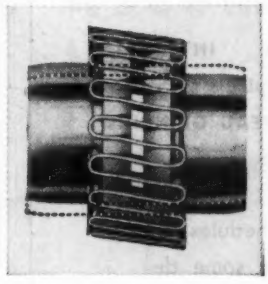




ANGULAR MISALIGNMENT. Under angular misalignment the design of the Falk Steelflex coupling permits a rocking and sliding action of grid and hubs that allows the greatest freedom of accommodation to angular misalignment, while at the same time transmitting the power through the resilient grid with no lost motion or backlash.

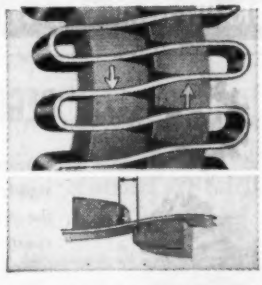
AT NORMAL LOADS, the grid bears on a larger area of the grooves (*2, 2a* in diagram) and the span of the grid is automatically shortened as the load increases, enabling it to transmit more power without increasing internal stress. The grid member maintains its capacity to absorb shocks, dampen vibration, and cushion the load.

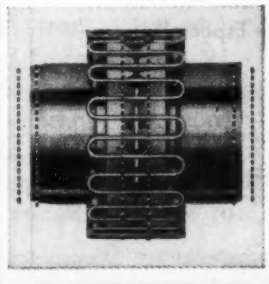




PARALLEL MISALIGNMENT. When parallel misalignment is involved, the resilience of the grid-groove combination comes into full play. The movement of the grid in the lubricated grooves accommodates the misalignment, while still permitting full function of the grid-groove action of the coupling in absorbing shock and dampening vibration.

AT PEAK LOADS, the rungs of the grid member then bear over almost the entire curved surfaces of the grooves (*3, 3a* in diagram) and the span of the grid becomes very short. The coupling still remains torsionally resilient. Also under the impact of shock loads the grid member flexes and transmits power smoothly and evenly.





PERMITS FREE END FLOAT. Because the grid member slides freely in the lubricated grooves, the Steelflex coupling permits free and independent end float for the shafts of both the driving or driven members, or of either one. If it is desired that end float be restricted, provision can be made to limit it to any required amount.

There are 13 types and 33 sizes of Falk couplings to meet all requirements. For specific information and recommendations to meet your needs, call the nearest Falk representative or distributor.

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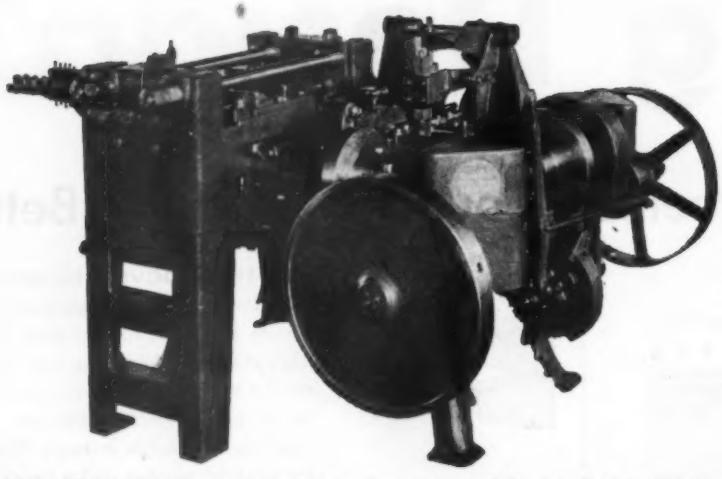

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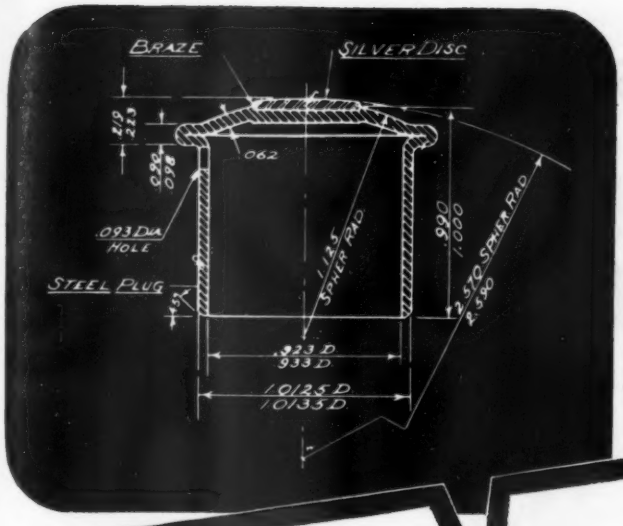
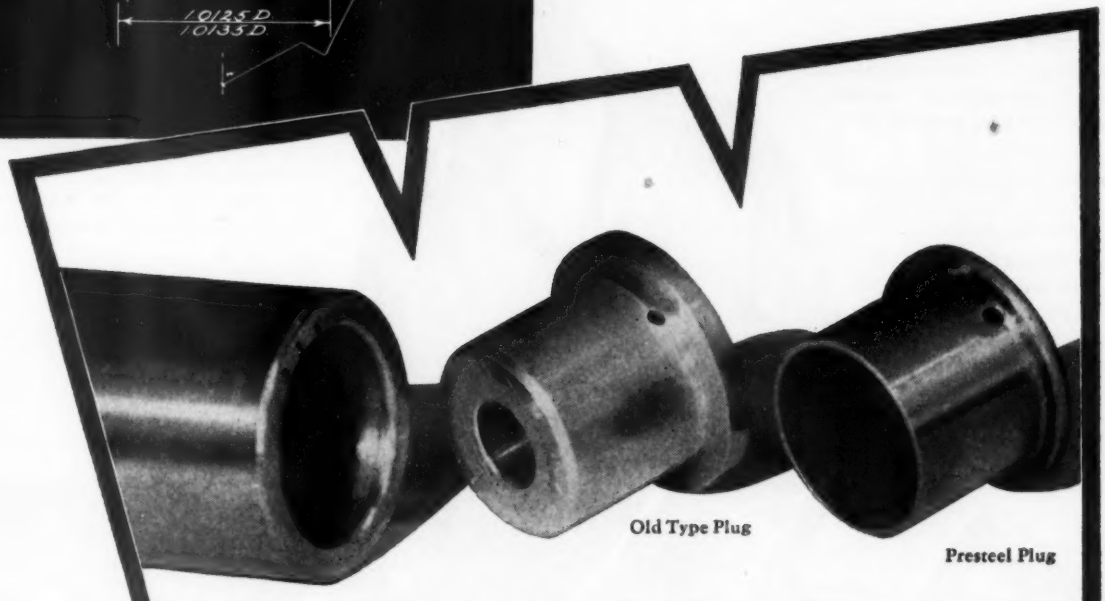


Detail Drawing of the Steel and Silver Plug



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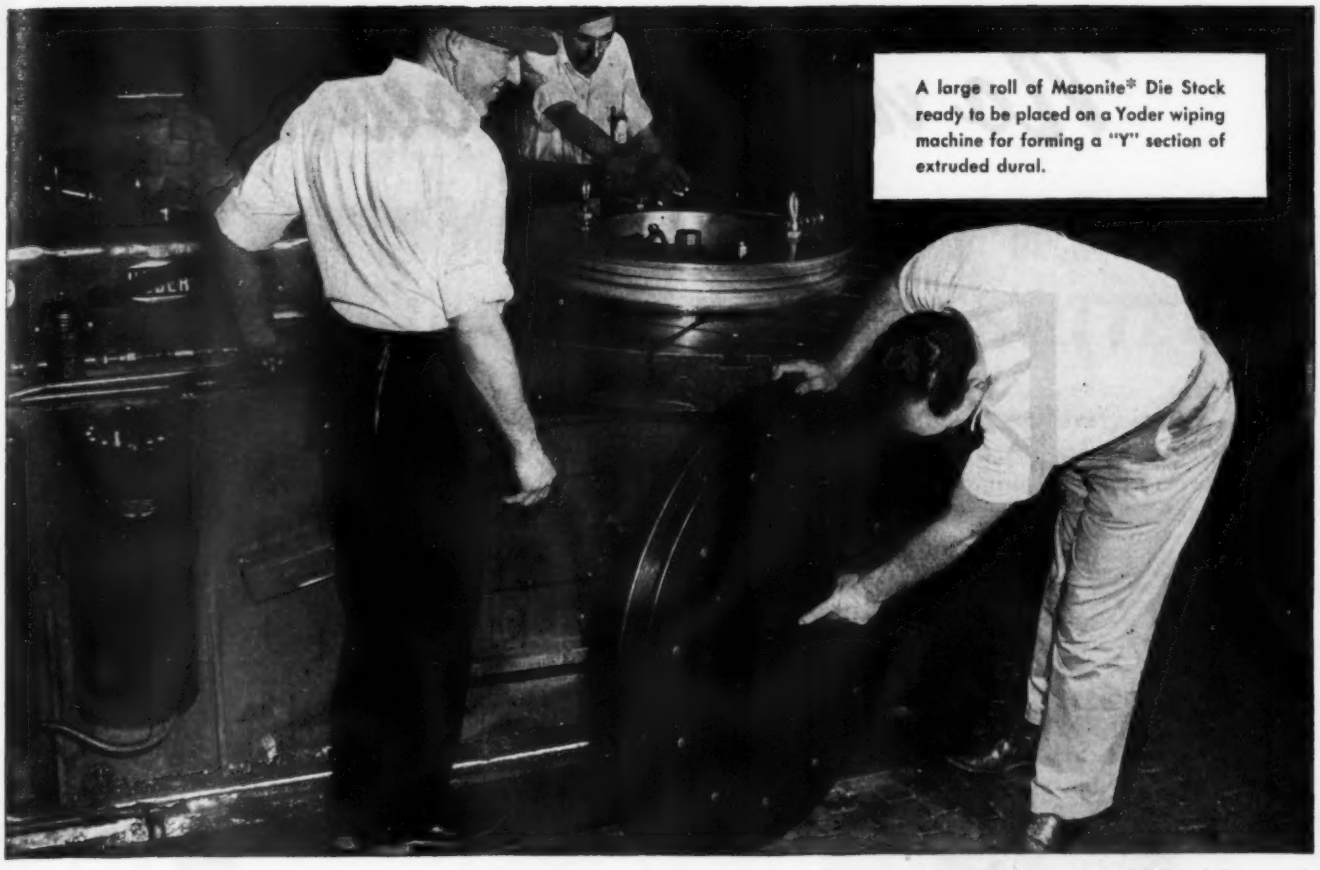

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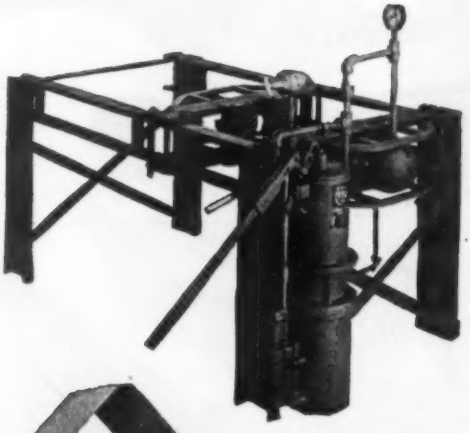

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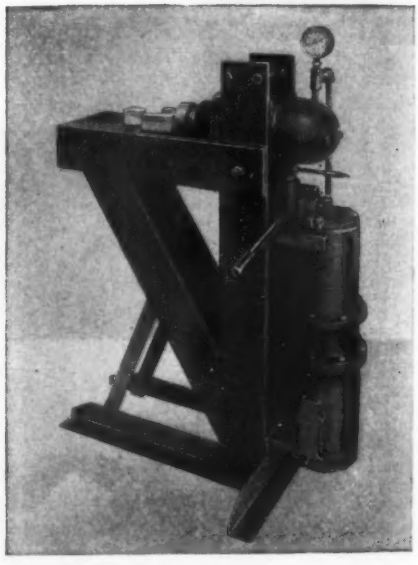

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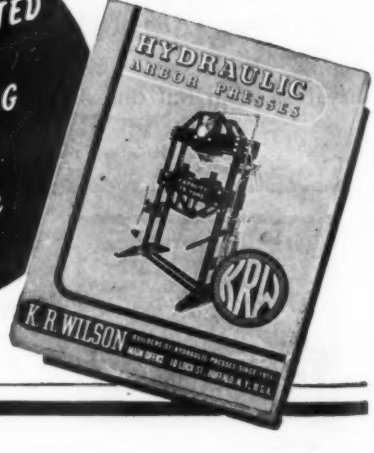

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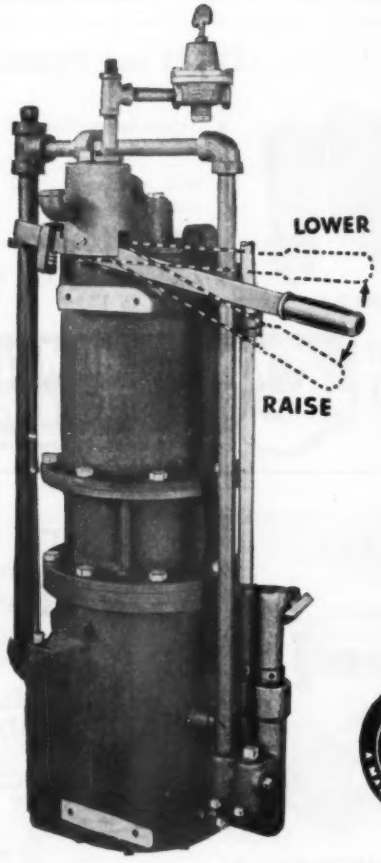

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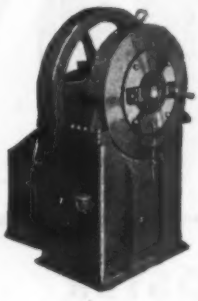

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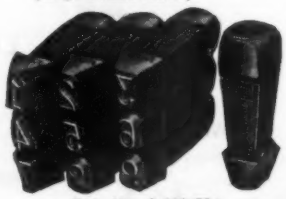

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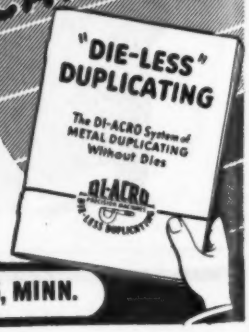

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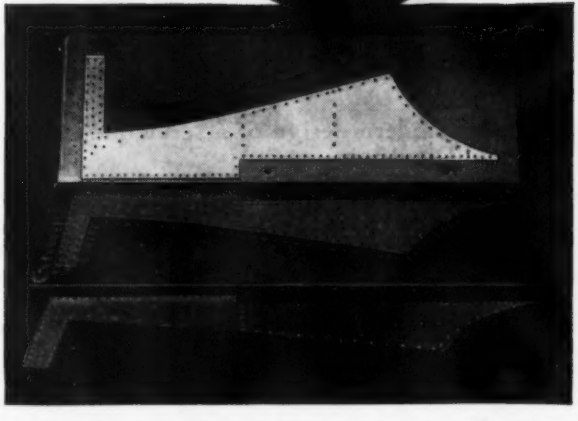

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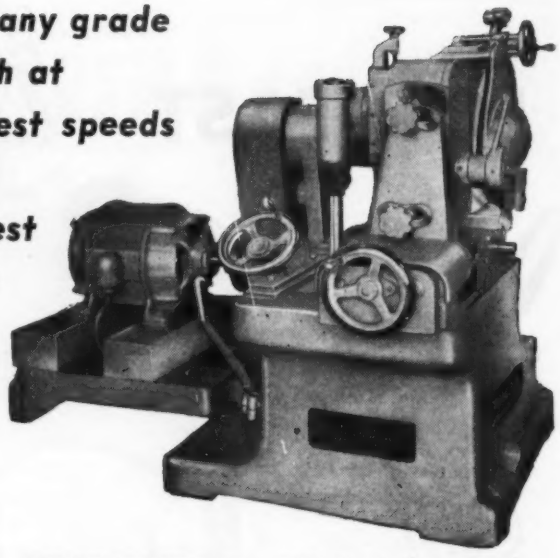

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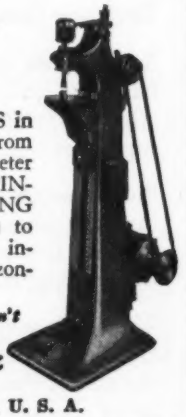

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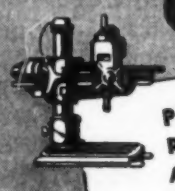

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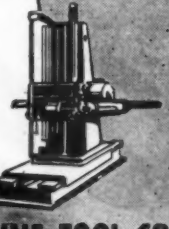

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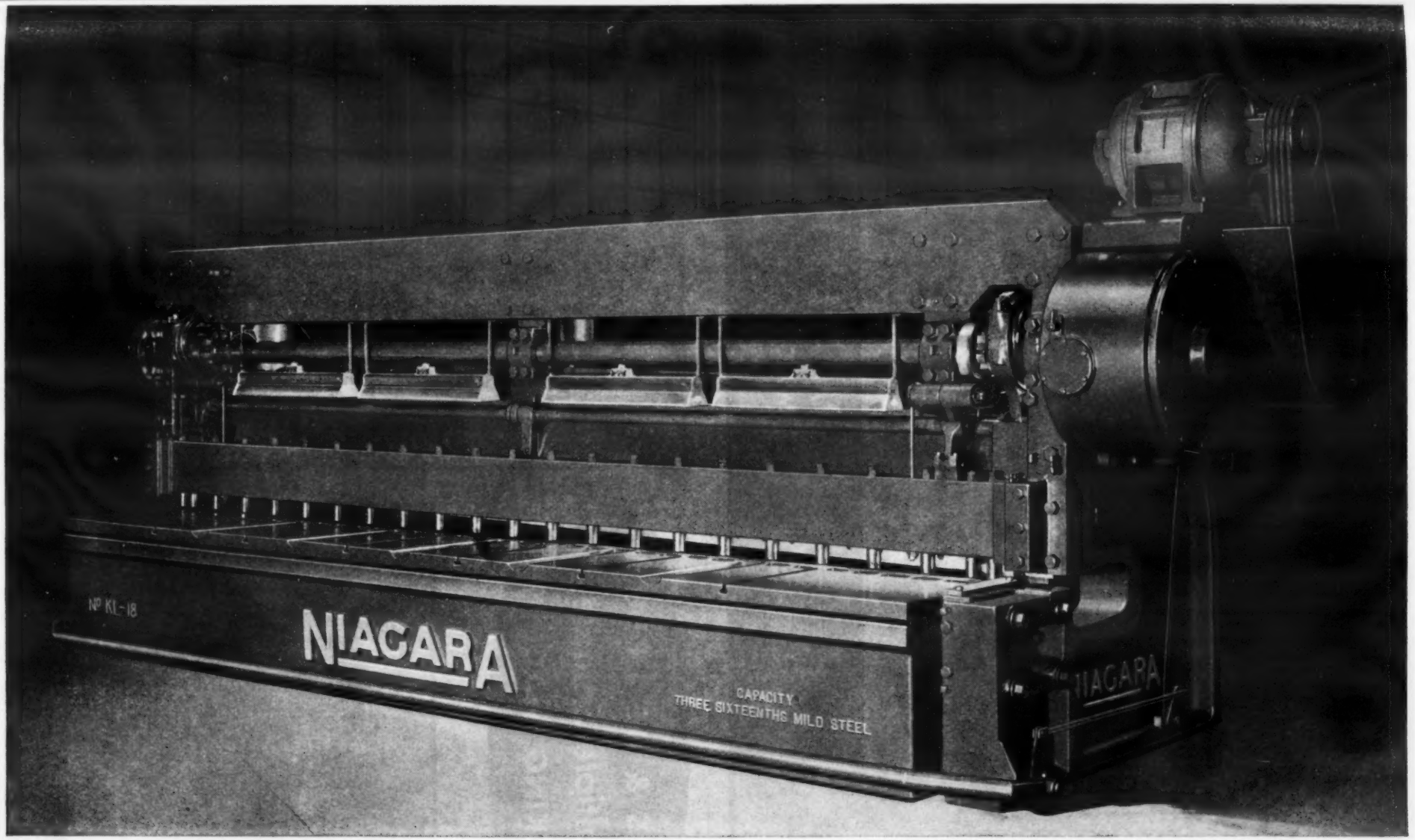

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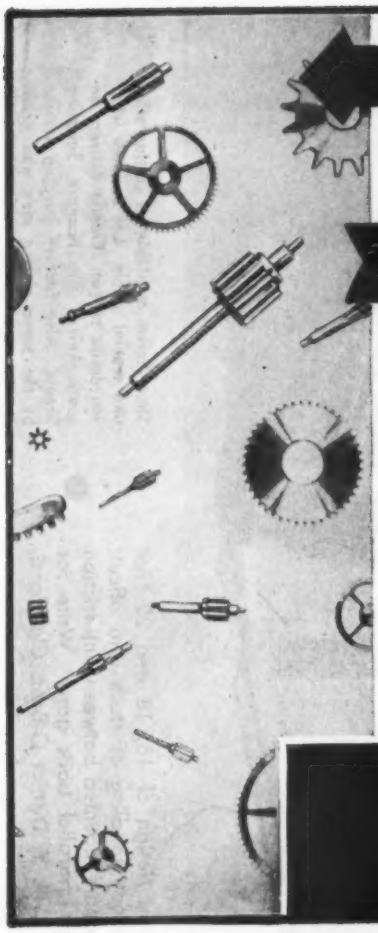

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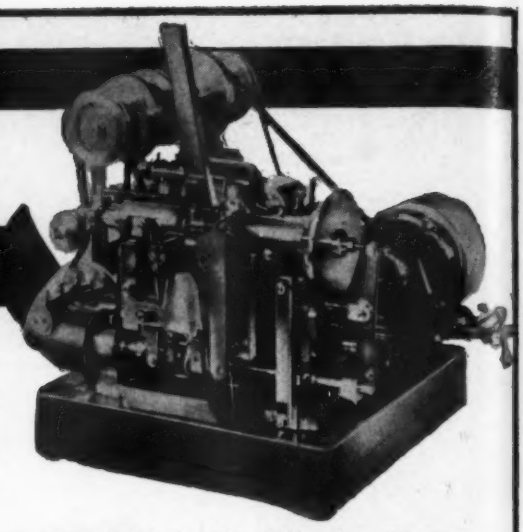
PINION & GEAR CUTTING MACHINES



These bench machines, for cutting fine pitch gearing, such as those used in watches, instruments, time fuses, etc., employ a revolving cutter which makes successive cuts. Blanks are held and indexed by the work spindle. Only straight cuts can be made.

Cutter spindle is designed for high speeds. The entire machine is sturdily built for precision and long life. Each type machine is convenient, easy to operate and highly productive.

Full details and specifications are available on request.

Available in the following Types

In each of the following machines, the same cutting method is used, namely a revolving cutter which makes successive cuts on blanks held and indexed by work spindle.

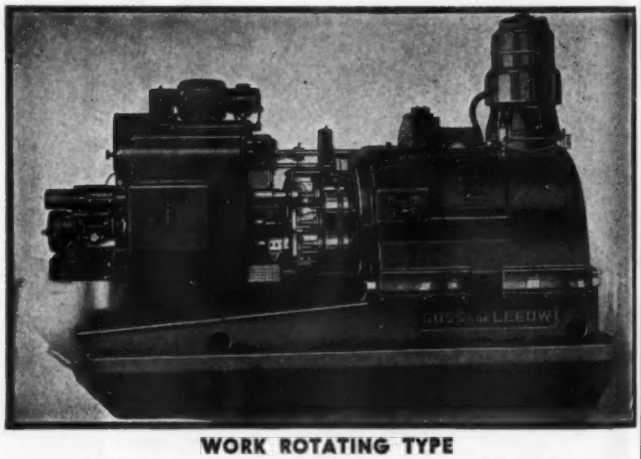
Single-Cut Pinion Machines, Multiple-Cut Pinion Machines, Magazine-Fed Pinion Machines, Gear Cutting Machines

CAPACITY: Pinion Machines, ½" dia.
Gear Machines, 1½" pitch dia.

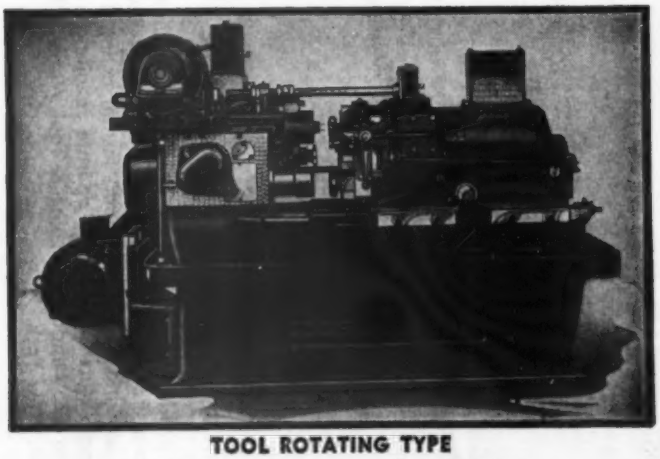
WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

WALTHAM
MACHINE WORKS,
WALTHAM, MASS.

GOSS & DE LEEUW
Multiple Spindle
CHUCKING MACHINES



WORK ROTATING TYPE
5 Spindles • 6 Spindles • 8 Spindles



TOOL ROTATING TYPE
4 Spindles • 5 Chucking Positions

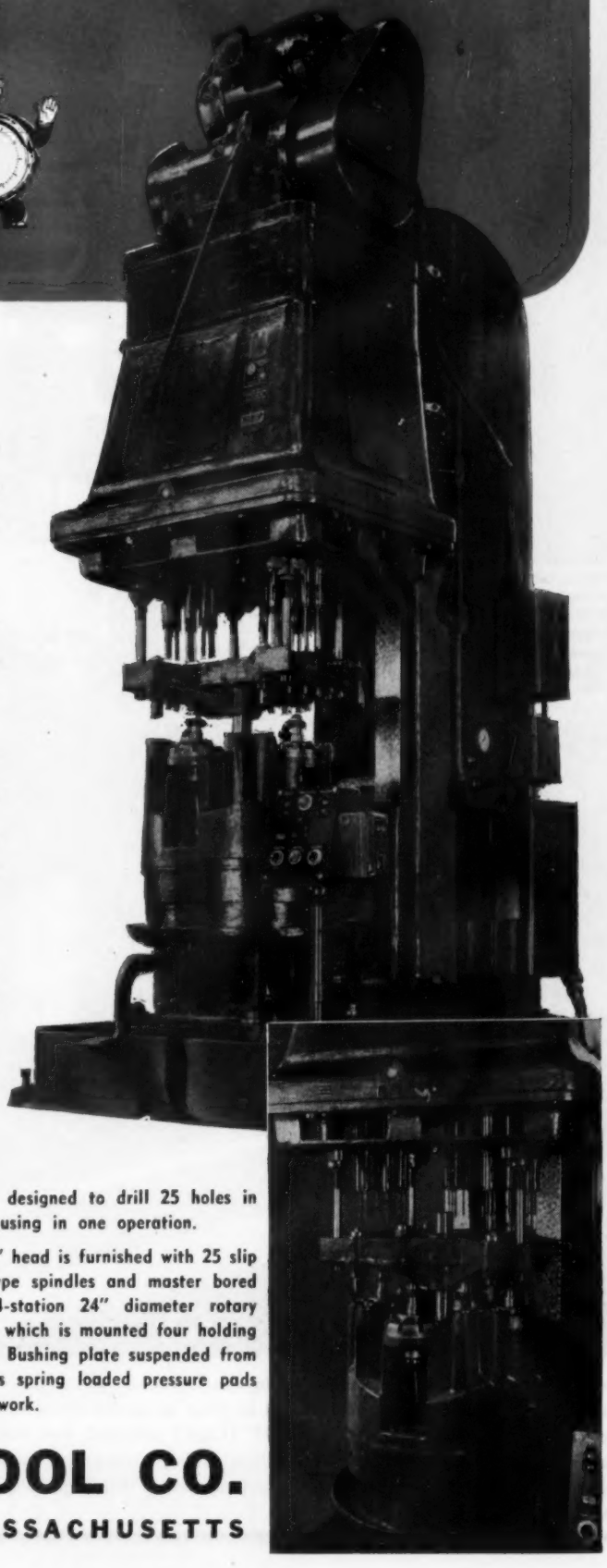
Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

Time... WAITS FOR NO MAN!

"Says Stop-Watch Pete of BAUSH"



Most manufacturers realize the many advantages and savings in time offered them by multiple spindle machine tools—whether it be drilling, reaming, tapping or boring.

Baush has led the field in multiple spindle machine tools designed to do such work faster, more accurately and with far greater economy.

The Baush Vertical W-6 Hydraulic Multiple Spindle Drilling Machine illustrated is just one example of the hundreds of Baush Special purpose machine tools that are today saving the "TIME" that does not wait.

Don't "WAIT"—send us your problems now—let us show you how to save "TIME" in any of these machine tool operations.

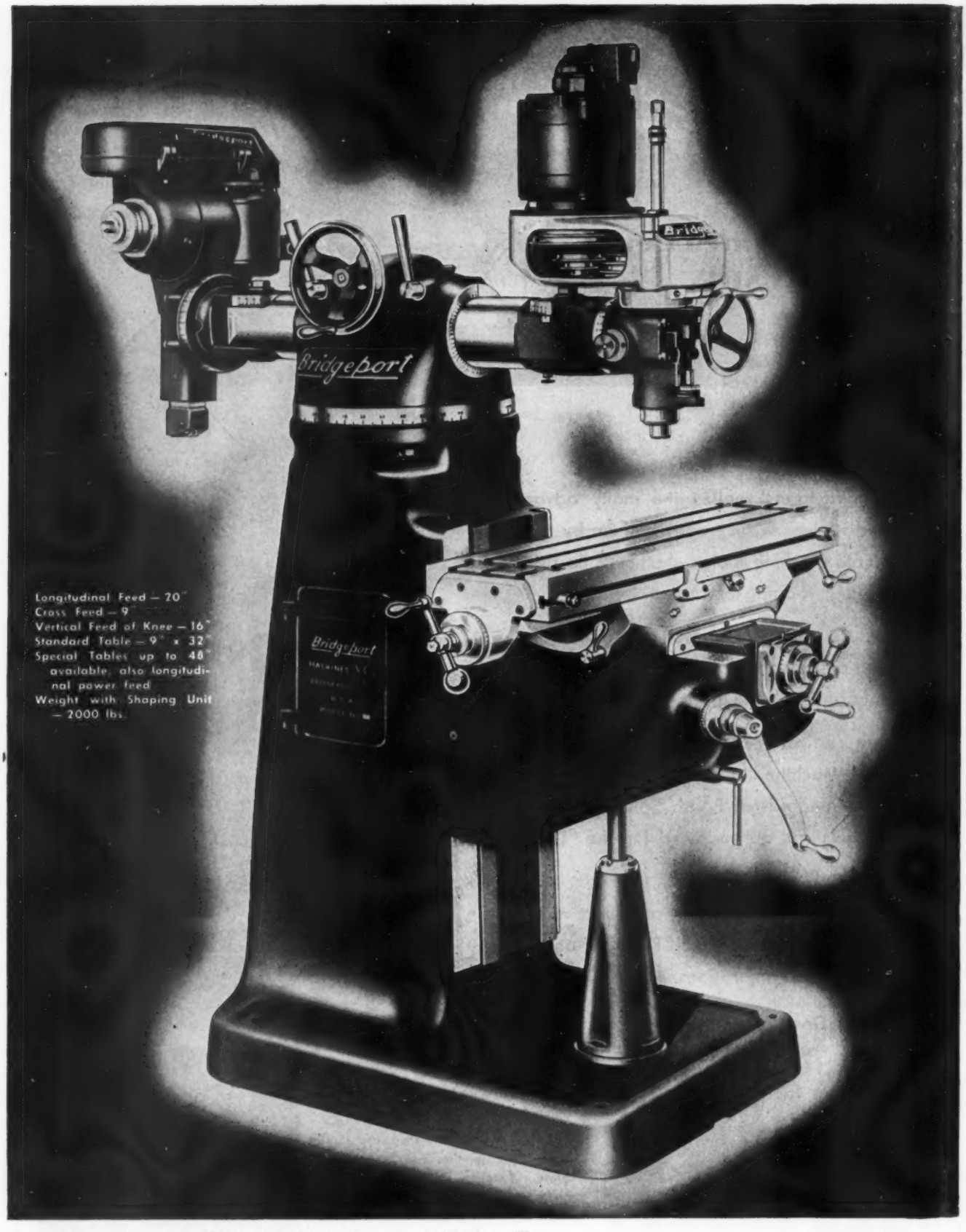
Descriptive literature sent upon request

BAUSH

1. Machine designed to drill 25 holes in pump housing in one operation.
2. 18" x 24" head is furnished with 25 slip sleeve type spindles and master bored plate. 4-station 24" diameter rotary table on which is mounted four holding fixtures. Bushing plate suspended from head has spring loaded pressure pads to hold work.

MACHINE TOOL CO.

SPRINGFIELD 7, MASSACHUSETTS

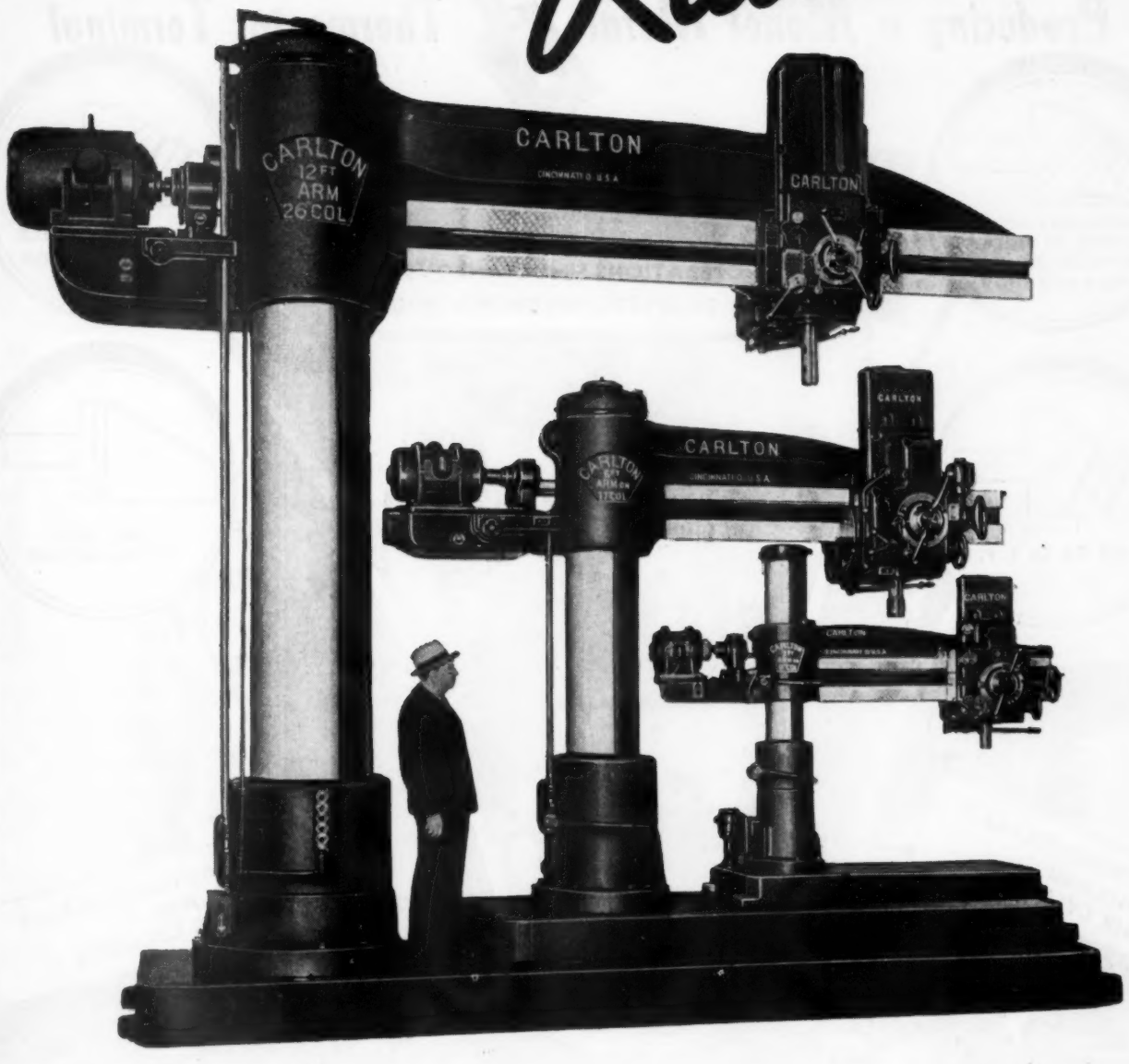


Longitudinal Feed — 20"
Cross Feed — 9"
Vertical Feed of Knee — 16"
Standard Table — 9" x 32"
Special Tables up to 48" available, also longitudinal power feed
Weight with Shaping Unit — 2000 lbs.

Tomorrow's machine tools will be judged by the degree to which they will assure low cost production. Set up time will be given as careful consideration as cutting time. The fact that BRIDGEPORT TURRET MILLING MACHINES require but *one set up* for performing milling, drilling, boring and shaping *at all* angles, fast and accurately, is definite assurance of their high value in competitive production.

The Bridgeport MACHINES, Inc.
Bridgeport, Conn.

CARLTON *Radials* ...



● Twenty-six years ago The Carlton Machine Tool Co. brought out the original low hung drive bringing the drive down underneath the arm driving off the large diameter of spindle closest to the work. This drive has proven not only theoretically correct but practically correct, and that with the other new features of the Carlton Radial Drill has proven itself through actual demonstration in customers' plants. One of the leading Radial Drills on the market today in this Country or any foreign country.

There are thousands of these radial drills being used by all the large leading manufacturing companies in the United States, as well as foreign countries. The upkeep and repair parts in the past 26 years has almost been nil.

The above photograph shows the variation and sizes that the Carlton Radial Drill is made from the small 9" column with 3' arm to 26" column with 12' arm, and are furnished with sizes in between column diameters 9", 11", 13", 15", 17", 19", 22", and 26". In arm lengths of 3', 4', 5', 6', 7', 8', 9', 10', 11, and 12. Furnished with all types of bases: standard base, right angle base, double end base, three way base, four way base, and round base to enable loading the base while the operator is drilling. Also with either plain box or universal tables.

The following features speed production and help produce more work, faster at lower cost. Low hung drive to spindle—anti-friction bearings throughout—centralized controls—unit construction—oiling required only once in six months—all drive parts running in oil—power rapid traverse to head and electro hydraulic column lock.

If your work calls for a radial you will get greater production—greater economy—greater satisfaction from a Carlton. Representatives in all large cities.

ARMY E NAVY

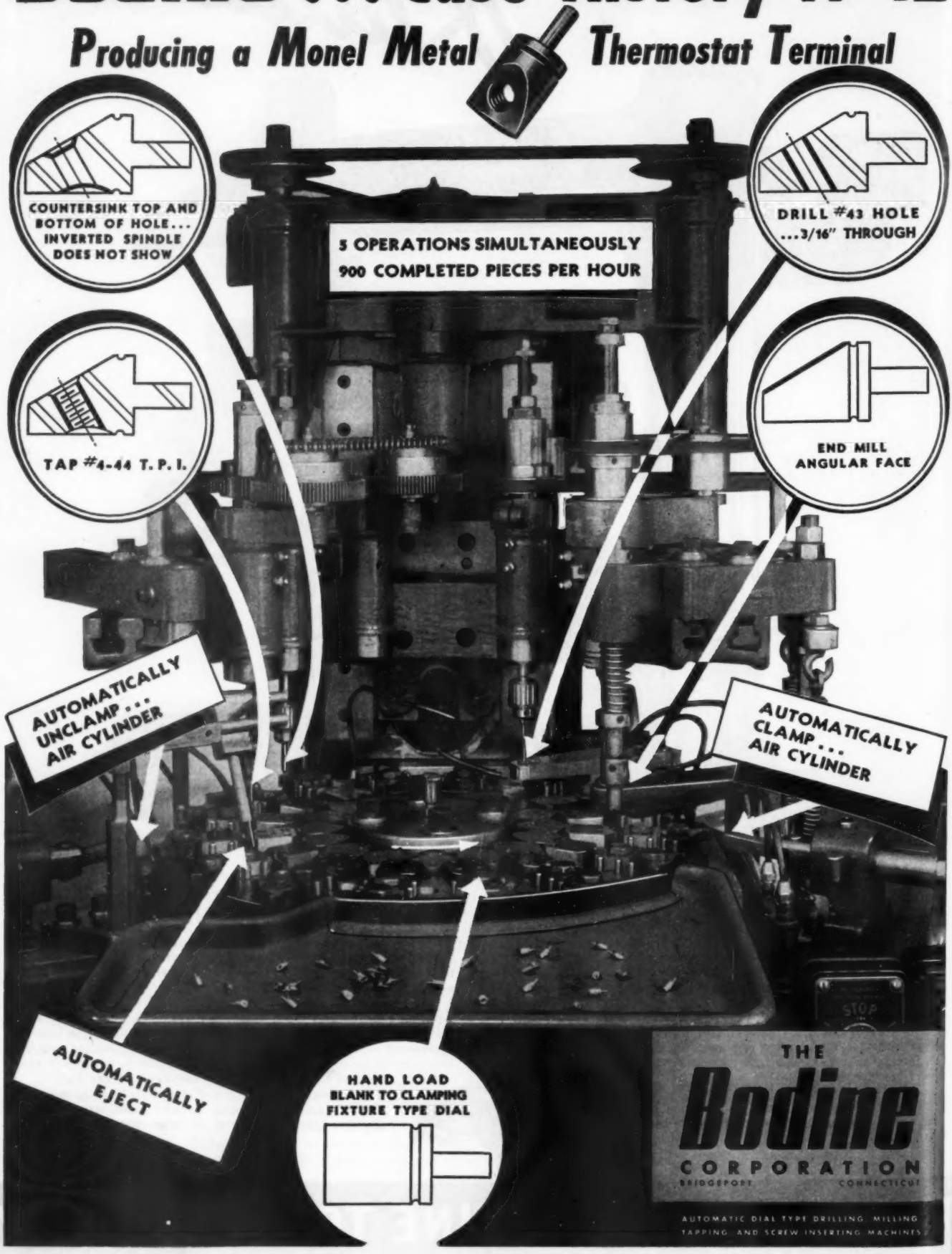
THE CARLTON MACHINE TOOL COMPANY

Manufacturers of RADIAL DRILLS *Exclusively*

CINCINNATI 25, OHIO, U. S. A.

Bodine ... Case History No. 12

Producing a Monel Metal Thermostat Terminal


COUNTERSINK TOP AND BOTTOM OF HOLE... INVERTED SPINDLE DOES NOT SHOW
DRILL #43 HOLE ...3/16" THROUGH
5 OPERATIONS SIMULTANEOUSLY
900 COMPLETED PIECES PER HOUR
TAP #4-44 T. P. I.
END MILL ANGULAR FACE
AUTOMATICALLY UNCLAMP ... AIR CYLINDER
AUTOMATICALLY CLAMP ... AIR CYLINDER
AUTOMATICALLY EJECT
HAND LOAD BLANK TO CLAMPING FIXTURE TYPE DIAL
THE Bodine CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

THESE 7 USERS "TELL ALL" ABOUT GEMCO SHAPERS

(From Letters In Our Files)

A Tool Room Foreman Says:

"We have two GEMCO Shapers in our Tool Room, and whenever I have a particularly difficult job to do, I always see that it is done on the GEMCO."

A Mfr. of Electric Motors Says:

"Our GEMCO Shaper is very satisfactory, and has proven its worth to us many times over."

A Circuit Breaker Mfg. Co. Says:

"We have had this shaper about a year, and our tool makers are still talking enthusiastically about it."

A Large Mfr. of Hand-Forged Tools Says:

"We are using a GEMCO to shape tough alloy steels to quite critical dimensions. We find the settings on the feeds accurate and easy to operate. Also, there is a definite saving in production time by the use of the motorized quick return on the table. And the "Lubrigard" safety is noteworthy as a feature to prolong the useful life of the shaper."

A Mfr. of Electric Elevators Says:

"Your shaper has a wide range of feeds and speeds, and the down feed on the tool post, especially, has been a big help to us. Our machinists like the GEMCO Shaper better than the majority they have seen or used."

A Pump and Machinery Corporation Says:

"The men in our tool room are most enthusiastic in their praise of the GEMCO Shaper's performance and accuracy, which was not even approached by the older machine it replaced."

A Leading Mfr. of Files and Rasps Says:

"GEMCO features such as downfeed of head, finger tip touch of traverse, and your lubricating system, are perfect. Our next shaper will again be a GEMCO."

GEMCO

Multi-Purpose SHAPERS

The Universal Type of GEMCO Shaper, shown above, is ideal for tool and die work, or where angular work set-ups are required. Check the following time-tested features: Exclusive "Lubrigard" Safety Device increases the precision life—Centralized Controls save time and effort, increase production—Large, easy-to-read dials—Wide range of feeds and speeds.

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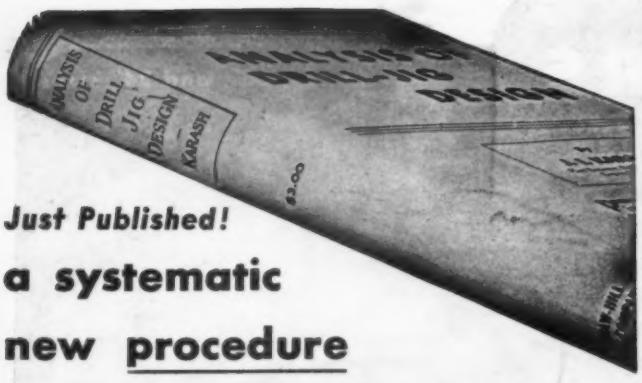

Just Published!

a systematic new procedure *for* TOOL DESIGN

The first book of its kind — an *analytical* study of the mental processes and decisions that actually constitute the most important part of design work. Using drill jigs as a specific case study, the book outlines fundamental principles and methods that apply in varied degree to all tool designing problems. It shows plainly each step in the process of design, how the steps relate to each other, and what is needed to best perform them. It establishes for you a basic efficient procedure, applicable to all types of tool design, that you can easily use to save valuable time and improve the practical quality of your work.

A systematic procedure of tool design that makes easier and more productive the mental steps in producing the best tool for the job.

ANALYSIS of DRILL JIG DESIGN

By J. I. KARASH

Plant Engineer, Reliance Electric & Engineering Co.

326 pages, 5½ x 8½, 243 illustrations, $3.00

CONTENTS

1. Outline of Design Practice
2. Gathering Information
3. Analysis of Drilling Operations
4. Division-of-work Decision
5. Machine Decision
6. Principles of Locating
7. Clamping
8. Secondary-operation Jig Features
9. Positioning Features
10. Chip Control
11. Principles of Interchangeability
12. Justification

This book fully demonstrates a new concept of tool design, so analyzing the mental processes of the work and setting up a definite, systematic procedure, that a workable design, of high productive efficiency, may be largely assured before the drafting board is approached.

The book shows how to:—

—eliminate unnecessary steps

—meet shop and production requirements most completely

—gather the information necessary in making decisions

—make the decisions required by shop and job factors, by the main and secondary operations to be performed, by locating, positioning, clamping, and chip-clearance problems, etc.

● The book considers drill jig design as consisting of a definite number of dissimilar but related problems which have got to be solved in a definite order.

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Milling and Jig Boring with a LINLEY is most economical because . . . initial cost and maintenance are low . . . toolmakers' time is saved by fast set-up and quick changeover . . . 8 speeds give you an exact choice from 275 to 4250 r.p.m.

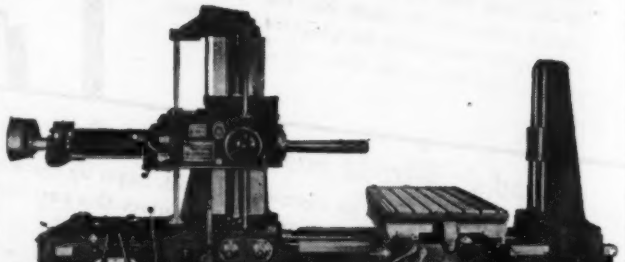
Moreover, you save larger machines for their rated capacity while handling die making, models, metal patterns, jigs, etc., on the 7"x17½" table.

The LINLEY is accurate, smooth running, rigid and compact, requiring but 18½" x 20" floor space. It is a sure money maker in any busy shop.

COMPLETE DATA IN BULLETIN . . . ON REQUEST

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

PORTAGE



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● A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

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Views of Two Major Departments in the Plant where

Hendey LATHES and SHAPERS are BUILT

These views of shop operations illustrate two very important departments in the plant devoted to the manufacture of Hendey Precision and Production Lathes and Shapers.

Department A takes care of the planing and heavy milling of all the main castings entering into the assembly of completed lathes and shapers. Also important boring and surface grinding operations are performed in this department.

Department B is the main assembly and run-off floor. Here all machines are first completed and then run-off and tested for final approval and acceptance for shipment to the long list of customers who have the required priorities necessary to obtain one or more of these highly valued Hendey machines.

In the 71 years in which this Company has been engaged in the manufacture of machine tools, many thousands of Hendey Lathes and Shapers have been sent out from this plant to all parts of the globe where manufacturing has been done which required machine tools.

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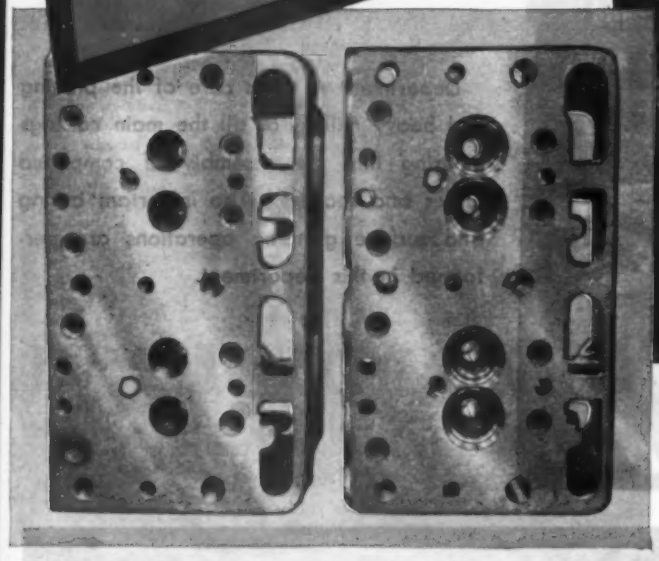
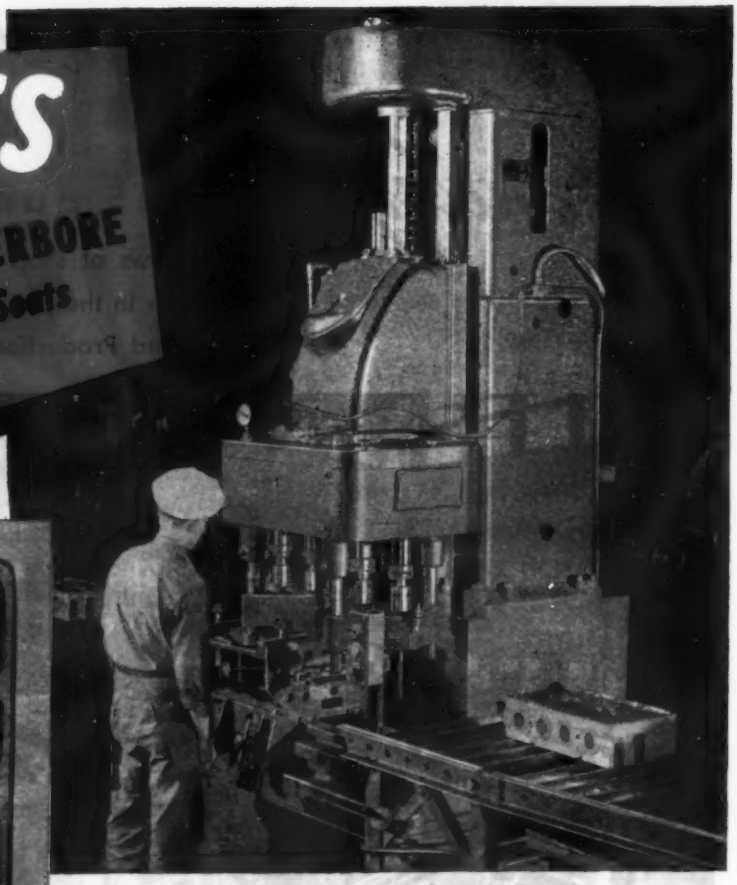
4½ MINUTES

TO DRILL, REAM and COUNTERBORE

Tractor Cylinder Head Valve Seats and Valve Guide Holes





W. F. and John Barnes 914 Vertical Machine Eliminates Additional Grinding Operation of Valve Seats . . .

Cylinder head valve seats and valve guide holes are drilled, reamed and counterbored in 4½ minutes in this plant on the W. F. and John Barnes No. 914 Vertical Machine, equipped with a special 4-spindle head. The excellence of the finish when all operations are completed has eliminated the necessity of grinding the valve seats.

The special head on this job operates in a cycle of rapid approach, feed, second feed, dwell, rapid return and stop, with rotation of spindles starting at beginning of cycle and stopping at return of cycle. A sliding type fixture is used, and the part is located from three finished surfaces and clamped by four toe clamps operated in pairs.

Special PRODUCTION MACHINING with THIS *Standard* UNIT

Designed for flexibility in drilling, reaming, boring, counterboring, chamfering, milling, hollow milling and facing operations, the W. F. and John Barnes 914 is a versatile standard machine of unit-type construction. Only tools and fixtures of appropriate design are required to meet your special production requirements. Changes in design do not obsolete the 914 since the basic unit is standard.

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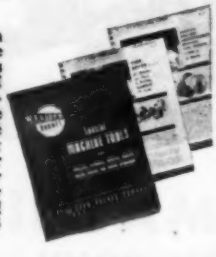
NEW . . . to key executives in metal working plants, the W. F. and John Barnes "SPECIAL MACHINE TOOLS" Book, with specific "Performance Data" case histories, taken from the field, and other interesting data. You can secure your copy, without charge, by writing on your company letterhead. Ask for "Special Machine Tools" Book 745



W. F. & JOHN BARNES

W. F. and JOHN BARNES

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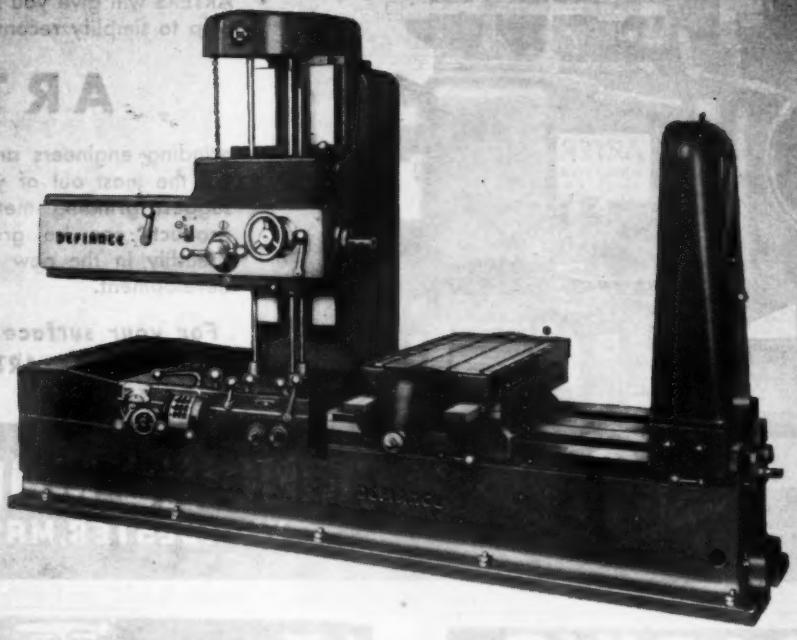
HORIZONTAL BORING MILL



● Defiance No. 22 horizontal Boring, Milling, Drilling and Tapping Machine has 2½" dia. spindle . . . rugged, simple and accurate for wide range of precision work in tool rooms. Speed and feed mechanism, and spindle housing are of unit construction.

Positive infinitely variable speeds from 25 to 1600 R.P.M. in either direction directly on the main spindle gives complete range of speeds on one spindle. 18 feeds in geometric progression, ranging from .002 to .125 per revolution of spindle. Five feeds are standard tapping leads. Column ways are 5" x 1½" and 18" across. Bed ways are 5" x 1½" and 24" across. Table ways are 4" x 1½" and 21" across. 24" x 36" table has working surface of its entire area with "T" slots and cross slots. Write. Defiance Machine Works, Inc., Defiance, Ohio.

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BUILDERS OF PRECISION MACHINERY SINCE 1850

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With your production change-overs, your ARTERS will give you the versatility that will help to simplify reconversion.

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grinding engineers are ready to help you get the most out of your machines and to suggest grinding methods by which your products can be ground accurately and speedily in the new days of industry and development.

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ACCURACY BOOSTS PRODUCTION

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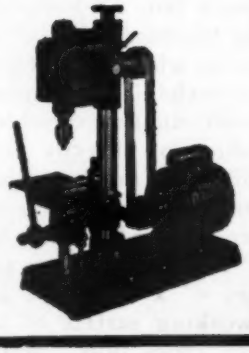

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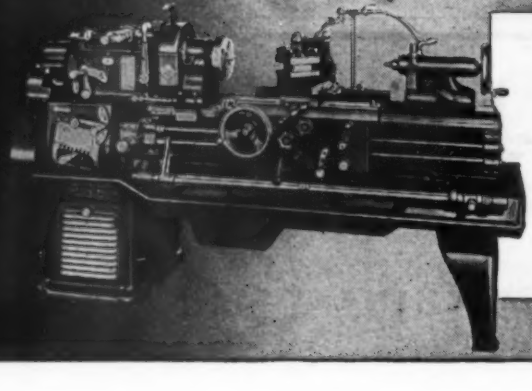
A high production sturdy little machine particularly suited to precision tapping of light work such as instruments, cameras, watches, clocks and business machines. Sensitivity of operation, and high spindle speeds account for accurate work without breakage of fine taps. Can be attached to any light socket. Write for complete information.

The Hamilton Tool Co.
HAMILTON OHIO

CINCINNATI LA



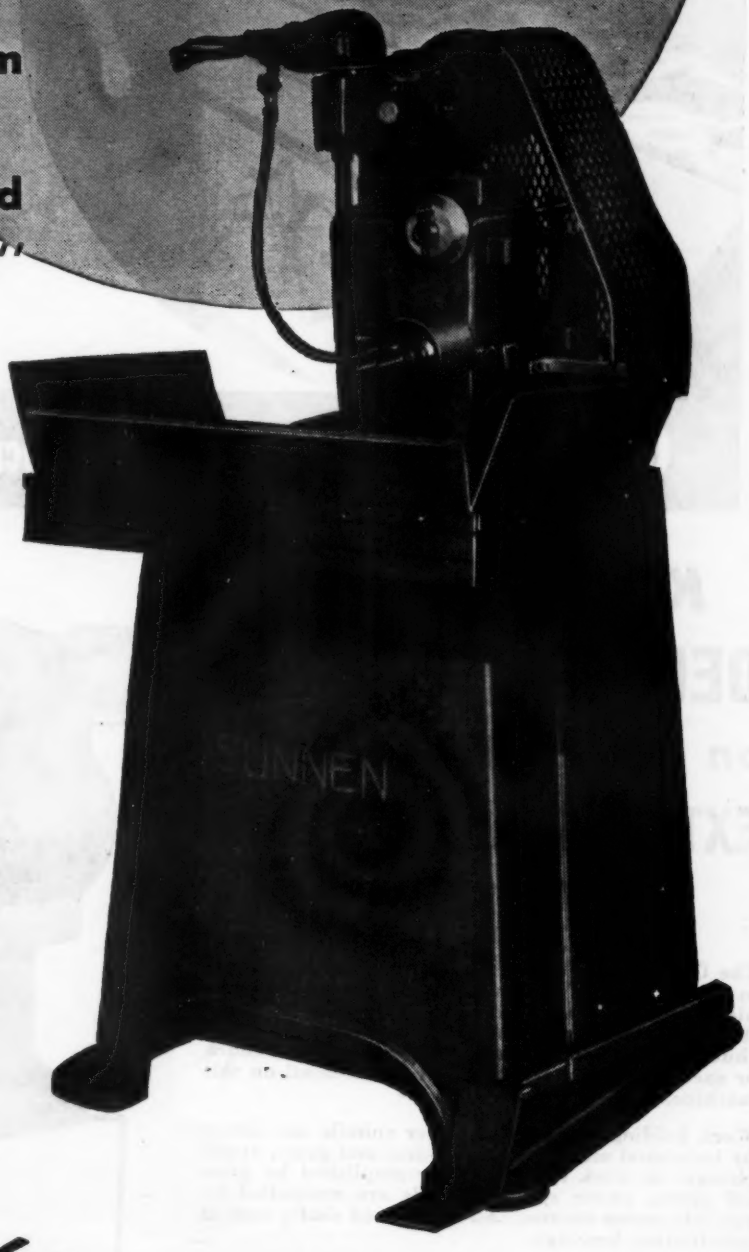
CINCINNATI LATHES—Built to Stand Tough Service

High speed operations involving heavy feeds on tough metals can be handled at low cost and with maintained accuracy on CINCINNATI LATHES because they are designed and made for this class of service. CINCINNATI LATHES have met every demand of all-out production, a fact which establishes their stamina for the requirements of the future. Sizes: 14" to 30". *Full details on request.*

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

Precision HONING

of diameters from .185" to 2.625" with a guaranteed accuracy of .0001"



With the Sunnen Precision Honing Machine you can hone and finish any internal cylindrical surface in any metal or plastic except lead or babbitt. Holes are straight and round and the surfaces produced are super-smooth—often from 2 to 3 micro-inches. This means longer life of parts, fewer rejects, and greater interchangeability of parts.

Here is a real precision machine that will increase production without the need for skilled labor. Any mechanically inclined worker can learn to turn out precision work in a few hours' time.

Let a Sunnen engineer show you how it can be used in your shop—on your jobs—or write for bulletin giving complete information on all the advantages of this machine.

SUNNEN PRODUCTS CO.
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St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

SUNNEN HONING

Speed ★ Accuracy ★ Finish

"WALKERS"...at work

One of a series of advertisements showing uses of Walker Magnetic Chucks on specific machines. In this case work held by the Walker Chuck is being ground on a Thompson Hydraulic Surface Grinding Machine.

. . . for accurate, flat surfaces, hold work with a "WALKER" . . .

The ease and convenience of holding large work securely by means of Walker Magnetic Chucks is well known to builders of surface grinders. That is why, on grinders by "Thompson" for example, you will find "Walkers" contributing to the speed and accuracy of these modern machines.

Machine tool manufacturers recommend Walker Magnetic Chucks for their dependability, holding power and long service life. If you have a problem in surface grinding, consult the builders of your machines on how best to hold the work.

There is a "Walker" to meet your requirements, whether you are interested in magnetic chucks of the Electro-Magnetic or Permanent Magnetic type.

Ask us to send full details on the latest Walker developments.

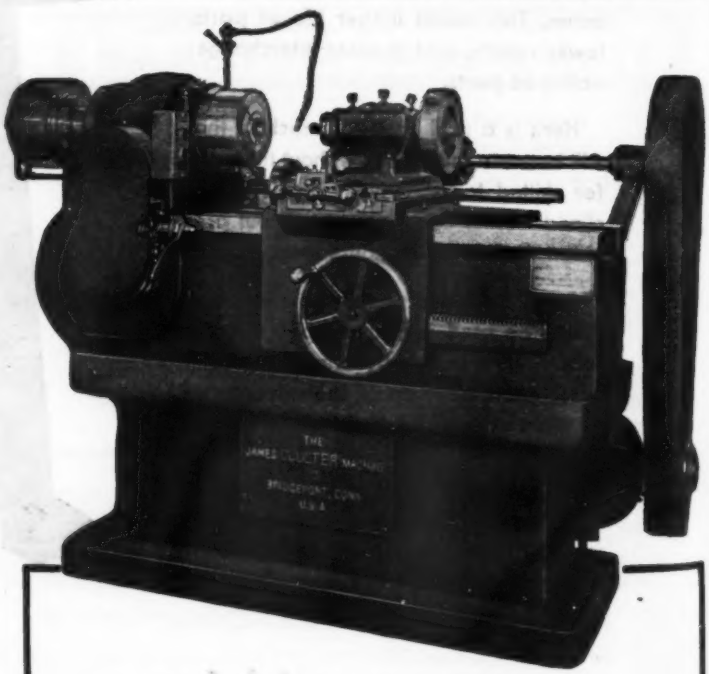
O. S. WALKER CO., Inc.— 201 ROCKDALE ST.— WORCESTER 6, MASS.

Keep Ahead of DEFENSE DEMANDS *on the PRODUCTION of* EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

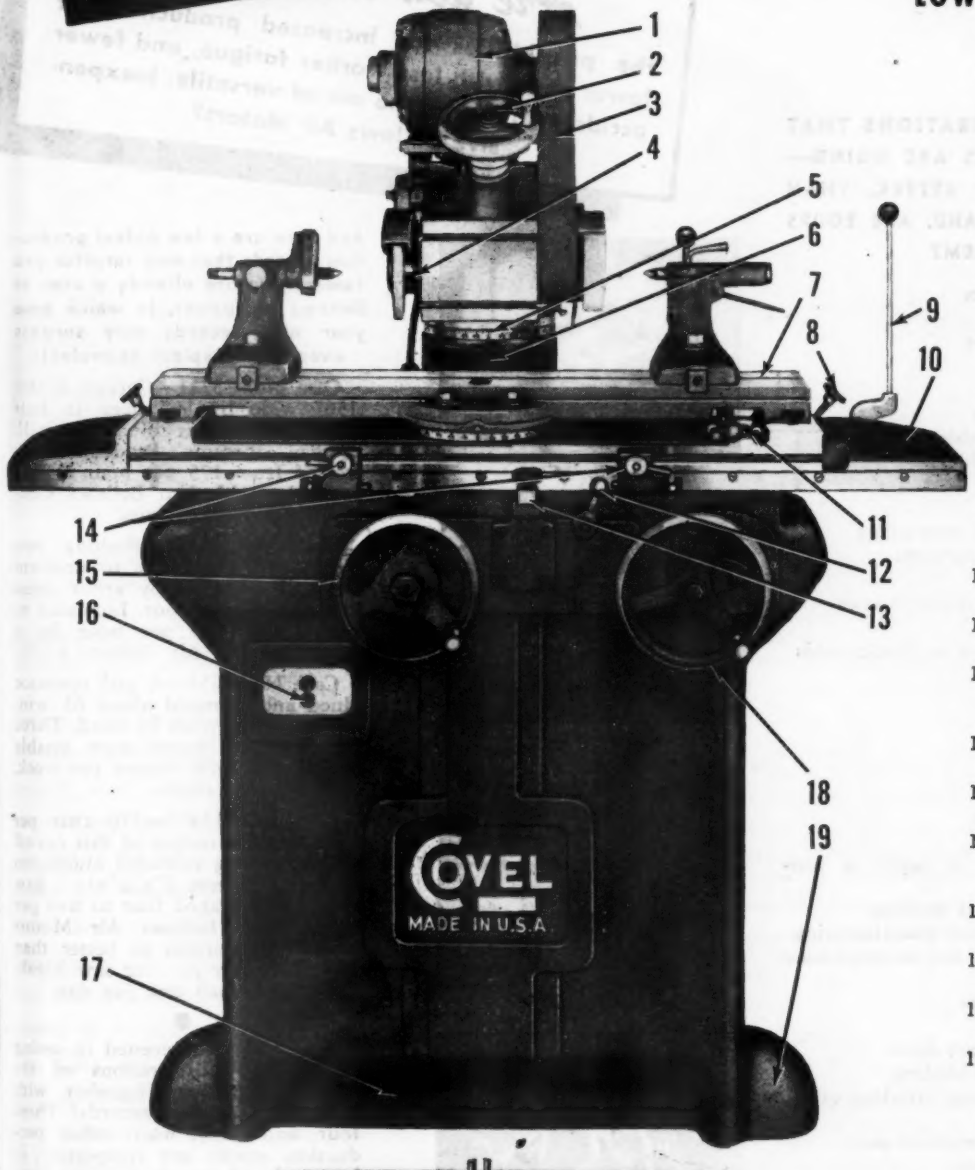
Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U.S.A.

19 Reasons Why COVEL NO. 12 Universal Cutter and Tool Grinder MEETS TODAY'S DEMAND — and TOMORROW'S



FOR SPEED, ACCURACY, LOW-COST PRODUCTION

1. ¾ H. P. spindle drive motor conveniently located, 3-speed V-belt pulley.
2. Elevating hand wheel with floating dial.
3. Belt guard splits for easy opening to change speeds.
4. Quill-type ball bearing spindle. Large, rugged and accurate.
5. Head swings on vertical adjustable column graduated in degrees.
6. Telescoping Metal Dust Guards.
7. Top table adjustable for taper grinding. Can be revolved 180° to increase capacity 3".
8. Quick-acting End Clamps.
9. Hand-rapid table traverse lever is removable, adjustable, convenient.
10. Table and cross-feed saddle move on balls.
11. Fine screw adjustment for taper.
12. Lock for sub-table (saddle and column locks also provided).
13. Table stops slide back, permitting dogs to pass.
14. Fine screw adjustable table dogs.
15. Large graduated cross feed hand wheel with floating pointer.
16. All electric switches are convenient to operator.
17. Toe-room in front of base for operator comfort.
18. 2-speed hand wheel for longitudinal table travel.
19. Cover plates over hold-down bolts.

Write for Bulletin No. A-145.

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

ARE YOU MISSING a Good Bet?

Are you overlooking

the possibilities for increased production, at lower cost, with less worker fatigue, and fewer accidents, through the use of versatile, inexpensive Bellows Air Motors?

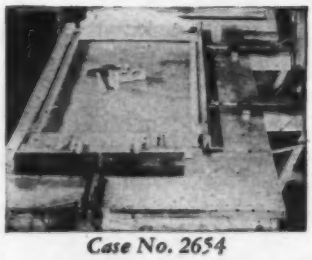
Here Are

A FEW TYPICAL OPERATIONS THAT BELLOWS AIR MOTORS ARE DOING—FASTER, SAFER, AND BETTER, THAN COULD BE DONE BY HAND. ARE YOURS AMONG THEM?

Operating vises and fixtures
Feeding work or tools
Opening and closing collets
Indexing work on fixtures
Powering turret beds
Powering lathe cross slides
Feeding milling machine tables
Feeding surface grinder tables
Feeding drill presses
Feeding tappers
Raising and lowering drill press tables
Raising and lowering testing tanks
Light riveting operations
Operating steel and abrasive cut-off saws
Light pressing operations
Opening and closing rubber or plastic molds
Feeding plastic extruders
Light duty broaching jobs
Tube Flaring
Tube Bending
Stamping
Punching
Metal forming or piercing
Operating glass molds
Operating cutter knives in paper or boxboard cutting
Setting dowel pins in wood working
Glue clamping for furniture manufacturing
Closing grommets in tents and awnings manufacturing
Opening and closing valves
Stapling box cameras
Opening and closing furnace doors
Operating presses in book binding
Clamping castings for snag grinding or chipping
Feeding wood through planers or saws
Threading wooden spindles
Operating wrapping machines
Operating slides in grain chutes
Staking

Case No. 15711

Case No. 25541



Case No. 2654

Case No. 12473

And here are a few actual production records that may surprise you (unless you are already a user of Bellows equipment, in which case your own records may surpass even these typical examples):

Case No. 15711—Cutting a slot .156" wide by ½" deep in half hard brass on a double acting mill. Woman operator. Production increased from 175 per hour to 600 per hour with two Bellows Controlled-Air-Power Units.

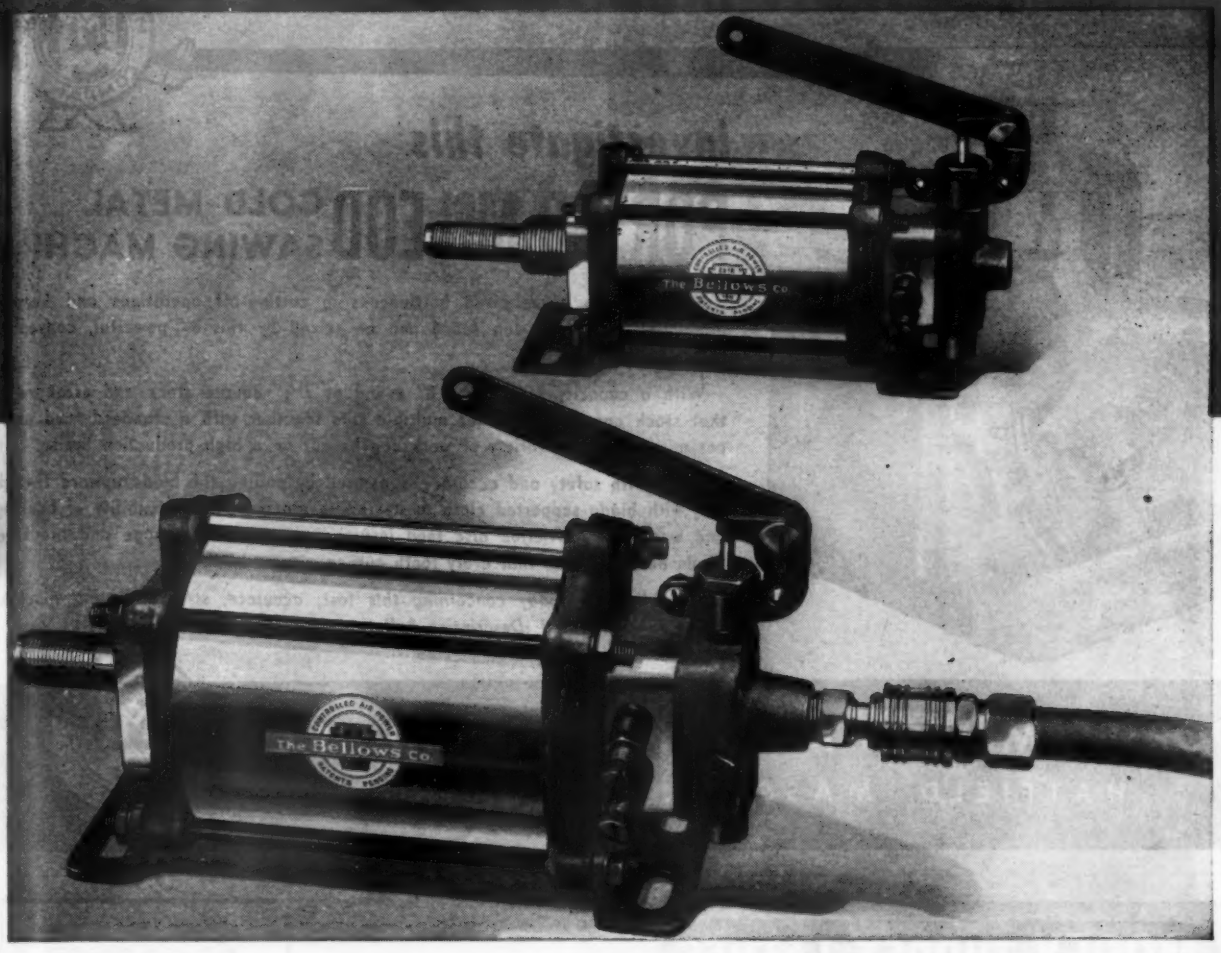
Case No. 25541—Pushing two pins into a shell fuse to uniform depth. Production by arbor press method 350 per hour. Increased to better than 800 per hour by a single Bellows Air Motor.

Case No. 2654—A girl operator glued and clamped about 65 window frames a week by hand. Three Bellows Air Motors now enable her to clamp 400 frames per week, and with less effort.

Case No. 12473—270 cuts per hour was the output of this cut-off saw in cutting extruded aluminum strips into pieces 3"x⅞"x½". Saw breakage averaged four to five per shift. Three Bellows Air Motors boosted production to better than 1000 per hour . . . cut saw breakage to less than one per day.

●

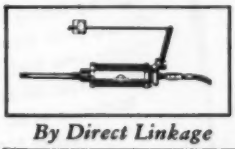
Would you be interested in seeing full 8" x 10" illustrations of the above installations, together with cost and production records? These four, and many, many other production stories are completely illustrated and described in our new, large Photo Facts File — yours, without cost or obligation, on request.



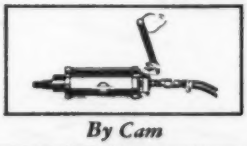
What Are BELLOWS AIR MOTORS?

Bellows Air Motors are small, compact, air-driven, double-acting, reciprocating power units with unique control features. They operate on any air pressure up to 175 lbs. They differ from conventional air cylinder design in that the valve and operating controls are integral with the cylinder permitting full and positive control over all operating phases at all times. Installation is simple, quick and easy Only one air connection is required and this may be made either with flexible air hose or rigid piping.

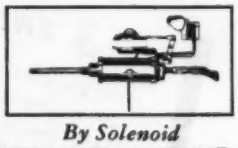
Independent speed control valves provide precise and unlimited speed control of piston rod advance and retraction . . . out fast, back slow, out slow, back fast, out slow, back slow, or out fast, back fast. The valve operating lever is adjustable to "any angle in any plane" permitting easy connection and ready synchronization to any reciprocating machine movement.



By Direct Linkage



By Cam



By Solenoid

CONDENSED SPECIFICATIONS

	BM5	BM10
Thrust	4.9 times Operating Air Line Pressure	10.32 times Operating Air Line Pressure
Overall Length	Stroke plus 6 25/32"	Stroke plus 7½"
Overall Height	4⅛"	5 13/32"
Overall Width	3½"	4¾"
Standard Strokes	1½, 2½, 6, 9, 12, 15, 18"	1½, 3, 6, 9, 12, 15, 18"
Special Strokes	½" to 48"	½" to 48"
Mounting	Angle Mounts for bottom, top, or side mounting standard equipment with both models. Trunnion or Pivot Mounts available on order.	

The Bellows Co.

Established 1911 — AKRON 10, OHIO — 861 E. Tallmadge Avenue

IF YOU'RE LOOKING FOR **TRULY HIGH PRODUCTION**

investigate this

PORTER-McLEOD COLD METAL SAWING MACHINE

Your problem of relieving bottlenecks in cutting-off operations and keeping production moving at top speed can be solved by this 8" powerful, convenient Porter-McLeod machine.

With a capacity for cutting 8" round or 7½" square stock and arranged so that stock can be nested for multiple cuts together with a standard feed of 3" per minute, a wide variety of work can be cut on a high production basis.

Speed with safety and accuracy is assured by pulling the blade upward through cut, with blade supported close to its rim to eliminate the possibility of buckling and weaving. A friction disc feed insures against blade damage and breakage. Blade design is such that every tooth cuts.

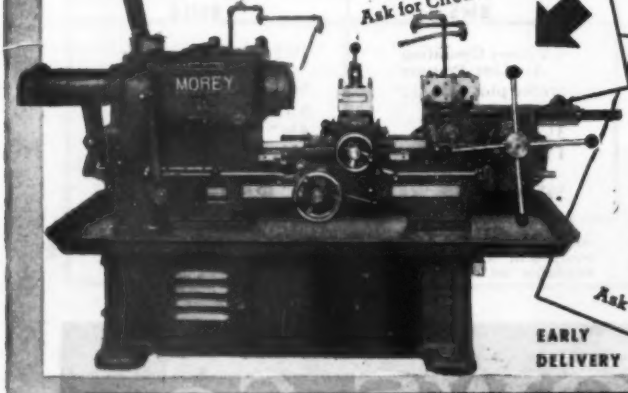
Get all facts today concerning this fast, accurate, straight-cutting machine. Write for Illustrated, Descriptive Bulletin.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.

MOREY TURRET LATHES
for BAR *or* CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM.
constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

GEARGRIND

UNIVERSAL·OSCILLATING CHUCKING GRINDER

● This versatile grinder was designed to handle external and internal cylindrical and conical surfaces, generated or formed spherical external and internal surfaces and generated or formed annular surfaces, such as ball bearing races and fillets.

In addition, this machine grinds combinations of the above in a single set-up, insuring both extreme accuracy and perfect blending of curved with straight surfaces.

The construction incorporates many features that result in accurate, fine finish, and low production costs —heavy, vibration-free base; precision preloaded bearings for vertical oscillating spindle, work head spindle and grinding wheel spindles, grinding spindles dynamically balanced; quick acting clamping attachments for collets or diaphragm chucks; micrometer feed screws for work head set-up and grinding wheel spindle; adjustable diamond wheel trueing devise.

Write for Folder

Contains full description of all features, complete specifications and types of work handled.

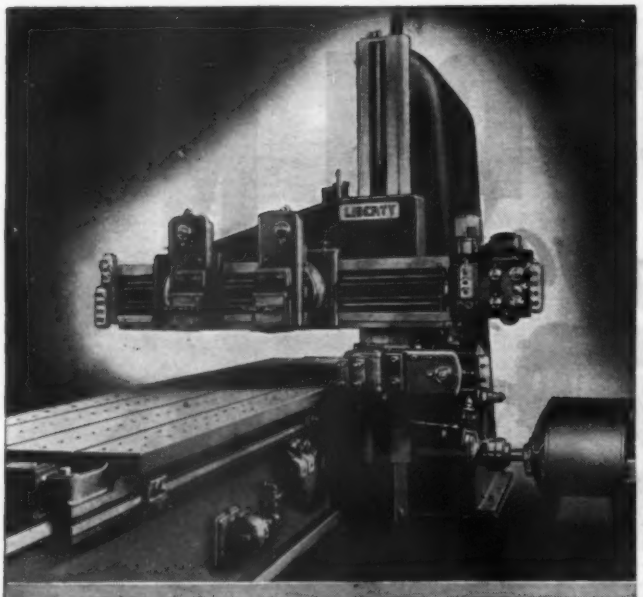
GEARGRIND FORMED WHEEL GRINDING

Investigate the complete line of GEARGRIND Machines for the Formed Wheel Grinding of external and internal gears, external and internal involute splines, straight splines, serrations and racks. Also special GEARGRIND Machines for special grinding operations.

CONTRACT GRINDING SERVICE

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

Manufacturers of the **RZEPPA** Constant Velocity Universal Joint.



LIBERTY

SMALL, MEDIUM AND HEAVY DUTY

PLANERS

FOR HIGH SPEED, LOW COST PRODUCTION

LIBERTY PLANERS • HAMILTON, OHIO, U. S. A.

Over a Quarter Century of Specialized Experience with Time Tested Principles of Design

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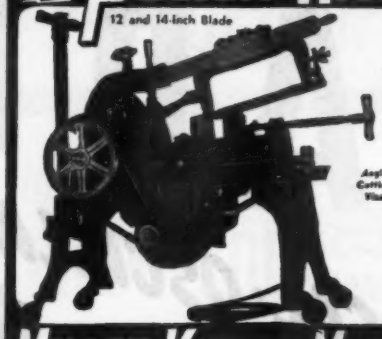
POWER HACK SAW

12 and 14-Inch Blade



LOW PRICED

•

PORTABLE

SELF-CONTAINED

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READY TO WORK

STURDY

ECONOMICAL

Write for Bulletin No. 100

MILLER-KNUTH MFG. CO. OMAHA, NEB.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

SMITH & MILLS

CRANK SHAPERS

sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

Dust NEED NOT MEAN *Ruin* TO MACHINES

Dust can be *ruinous* to bearings, motors, plant interiors, and workers' health. So why not *control* the dust in your plant, and add life to your machines and equipment by using the Filtaire Portable Dust Collector? This inexpensive unit is easy to operate—just plug it into any handy 110-volt outlet and it's ready to go. Filters may be of the permanent or replaceable type—motor and bearings are sealed against dust and grit—the Filtaire is adjustable for any grinding or polishing operation—it is self-contained and requires no hoods or piping—it will pay for itself quickly in dozens of spots in your shop.

Mail the coupon today for complete details.

EDWARD BLAKE COMPANY

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NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Please send me new Bulletin No. 444 describing the Filtaire in detail.

A.M.

Name..... Title.....

Company.....

Street.....

City..... State.....

. . . if it's easier

to move the saw to the work

get a *Portable*

WELLS No. 8

SPECIFICATIONS
WELLS No. 8

CAPACITY: Rectangular . . 8"x16"
(Special Guides) . . . . 5"x24"
ROUNDS: . . . . . 8" diameter
MOTOR: . . . ½ H. P., A. C. or D. C.
SPEEDS: . . . . Selective 60, 90, 130 feet per minute.
WEIGHT: . Approximately 750 pounds

WHY waste time and manpower moving stock to a fixed saw—it's easier to roll a portable Wells right where you want the cutting done. The Wells cuts quickly, most any shape or size metal you can get into it . . . with a minimum of labor. Easy to use, economical, this handy Wells No. 8 frees larger units for production work, pays for itself in time and labor savings. Write for details.

Products by Wells are Practical

Wells SAWS
THE SIGN OF SERVICE

Wells

METAL CUTTING BAND SAWS

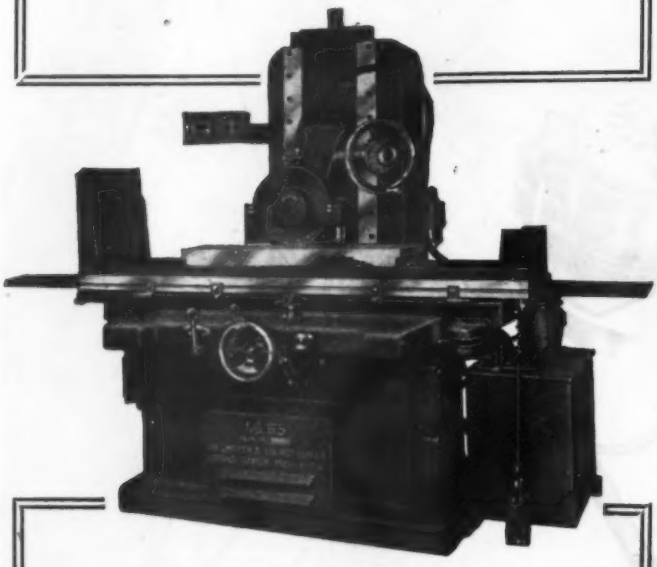
WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICHIGAN

GRAND RAPIDS

No. 55

Hydraulic Feed

SURFACE GRINDER



CAPACITY 12"x17"x36"

. . . for Toolroom or Production close tolerance grinding . . .

The No. 55 Grand Rapids is designed to assure high speed and accuracy. It has a table working surface of 12" x 36", an automatic longitudinal table travel of 38" and a traverse travel of 13½".

Features include the massive, sturdy "Grand Rapids" one-piece column and base, a construction which assures permanent alignment of cross travel and upright head ways. Saddle is a one-piece heavy rigid casting; spindle is mounted on preloaded ball bearings. Hydraulic feed assures smooth work.

Ask for Bulletin GL-100 describing the full line of Grand Rapids Grinders of this type.

GALLMEYER & LIVINGSTON CO.

300 Straight Ave. S.W.

GRAND RAPIDS 4 **MICH.**

MILLHOLLAND

Automatic **DRILLING - BORING MILLING - TAPPING** *Units*

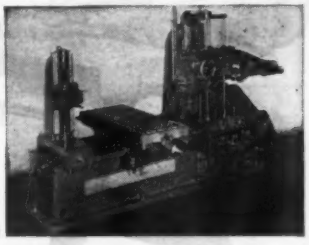
½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License issued by John Milton Luers Patents Inc.

Famous for

- **ACCURACY OF THREADS**
- **LOW CHASER COST**
- **ALL AROUND DEPENDABILITY**

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 238 Jan. 18, '45, American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Los Angeles: A. C. Behringer, 324 N. San Pedro St., San Francisco: Guy Reynolds, 454 Vernon St., Oakland Canada: F. Barber Machinery Co., Toronto, Canada.

Consider

LELAND GIFFORD

NO. 1 MOTOR SPINDLE DRILLING MACHINES

For Drilling Holes No. 80 to 5/16" diameter. Rigid, Accurate, Easy to Operate, Long Lived, Very Sensitive.

Send for Bulletin No. 400A

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WORCESTER 1, MASSACHUSETTS, U. S. A.

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

To help you protect your own and Uncle Sam's machine tools

THERE'S no need to tell most plant men that rust prevention has become a major problem to protect parts during production or in shipments. It will be increasingly important as machines are laid up temporarily or stored for Uncle Sam according to government requirements.

To help you in this job, Standard Oil Lubrication Engineers are ready to give you the benefit of their experience gained in working for other plants who have had the problem before you. These Engineers also have many of the rust preventives called for in government instructions for protecting machines and parts. They can save you the trouble of "shopping around" to find those you must use.

You can reach one of these Engineers by calling the nearest local Standard Oil Company (Indiana) office, or writing 910 South Michigan Avenue, Chicago 80, Illinois.

Buy more War Bonds

This booklet lists rust preventives that meet government specifications, which Standard Oil can supply. It gives the Army, Navy or Ordnance specifications under the product name and Standard Oil's brand number, with a very brief description of the use and methods of application of each rust preventive.

You can get a copy of this booklet from the Standard Oil Industrial Representative who calls on you or by writing Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANORUST

STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE

★ LUBRICATION ENGINEERING

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LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

You get all of these advantages in one grease

A wide range of temperature application

Plus grease gun or one-shot lubrication

Plus unusually long life

Plus better lubrication — less thinning out

One outstanding advantage of Stanobar Grease is that it can be applied by grease gun on a wide range of anti-friction bearing lubrication jobs. That's because Stanobar Grease has a smooth, non-fibrous, texture which is unusual in a grease that is suitable for both high and low temperature service.

There are other reasons—explained in the booklet offered—why Stanobar Grease can help you eliminate grease lubricating problems. Send for a copy or ask a Standard Oil Lubrication Engineer about the application of Stanobar Grease on your particular job. Write Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Illinois, for the Engineer nearest you.

Send for this booklet

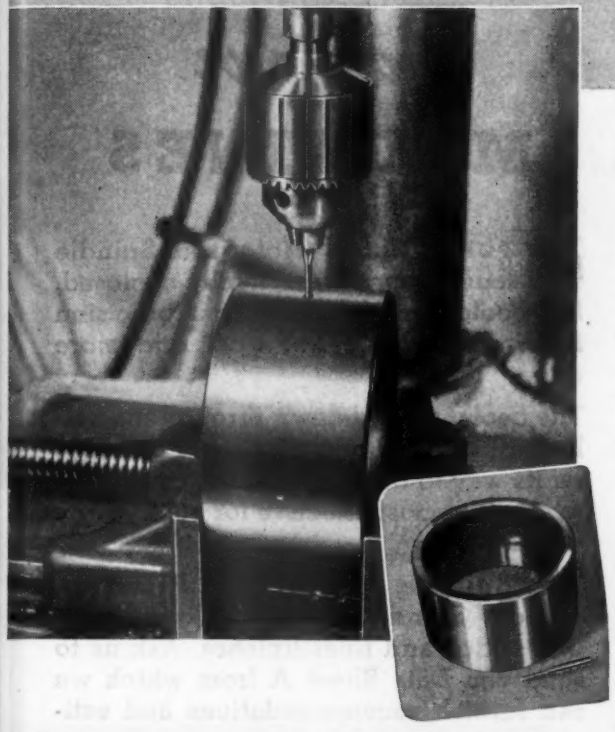
—it tells why Stanobar Grease gives the advantages listed above wherever it can be applied to your anti-friction bearing lubricating job. Ask your Standard Oil Industrial Service Representative for a copy of the book, or write or call the nearest Standard Oil Company (Indiana) office.

Buy more War Bonds

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

"HARDSTEEL" DRILLS



Save Time and Money by reducing SCRAP

The ability of "HARDSTEEL" drills to drill steel hardened by any method to any degree of hardness, has made it possible for them to solve countless production problems, where for various reasons, holes must be made after hardening. They have also proved invaluable in reclaiming dies, tools, or hardened parts which because of errors, hardening distortions or design changes were headed for the scrap heap. Two typical cases in point are shown here.

Case No. 1—70 Bearing Races Saved

These roller bearing races were nearly completed when it was discovered that the oil holes had been forgotten. Made of SAF-52100 steel, they had been hardened to 60 Rockwell "C." No ordinary drill could make the four required 5/32" holes through the .408" wall thickness. Annealing and re-hardening was out of the question. *"HARDSTEEL" drills did this job easily and quickly, saving every piece.* To prevent "walking" on the curved surface, a short drill at 2000 RPM started the hole, and regular length drill at 1900 RPM finished it. Coolant pumped to the work avoided discoloration.

Case No. 2—289 Cutters Saved

Hardening distorted the two driving pin holes beyond usable limits in 289 out of a batch of cutting tools. Several alternatives faced the manufacturer. They could be scrapped —entailing a loss of $1445.00. The holes could be trued up by grinding—a long and costly operation. They could be annealed and re-drilled—but there was still the danger of warpage on re-hardening. *Three "HARDSTEEL" drills, costing only $19.26, saved every tool* by drilling two new holes halfway between the distorted ones—and enabled delivery to be made on time. Material in the cutters is 1.05 carbon steel, fully hardened to 60 Rockwell "C." The 15/64" holes, 3/8" deep, were drilled at a spindle speed of 1900 RPM under a flow of coolant.

Learn to drill hardened steels without annealing. Write for the "HARDSTEEL" operator's manual. Also inquire about "HARDSTEEL" as a metal—ideal for special parts or tools that must meet unusual conditions of service.

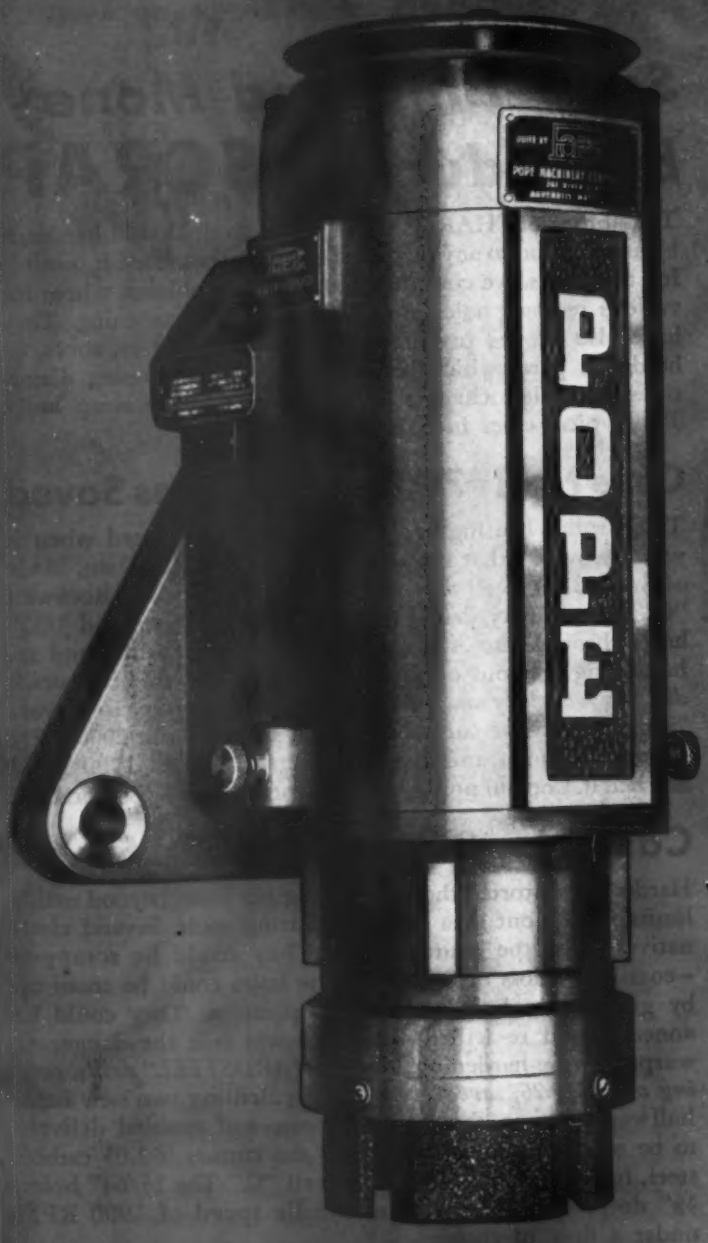
"HARDSTEEL"

DRILLS • TOOL BITS • SPECIALS

BLACK DRILL CO. • Division of Black Industries • 1400 E. 222nd St., Cleveland 17, Ohio

Other Divisions: Blair's Boring and Machine Co. • Mac-Rad Division

Picture This POPE PRECISION SPINDLE *on Your* MACHINES



This POPE Vertical Motorized Spindle with *sealed lubrication,* totally enclosed, fan cooled motor and super-precision bearings means *better work and more of it.*

The coolant is fed down through the hollow spindle, cooling motor and bearings on its way to the inside of the cup wheel where it is most effective for cooling the work.

This Spindle, like all POPE Precision Grinder Spindles, will give you more production and finer finishes. Ask us to send you Data Sheet A from which we can furnish recommendations and estimates.

POPE Vertical Spindles are available with 3, 5, 7½ or 10 HP Motor. Speed may be 600, 750, 900, 1200, 1800 or 3600 RPM, 60 cycle AC current. Even higher speeds are attainable with frequency changers.

POPE Vertical Motorized Spindles are used not only for surface grinders but for a variety of other purposes. Where working loads are largely radial, bearings are arranged to take care of them.

POPE

REG. U. S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING

Automatic *Rotation PROFILING

* WORK and MASTER **ROTATE** with TABLE MOVEMENT

CYLINDRICAL Interrupter Cam for Gun-Fire Control

A Typical HIGH PRODUCTION Profiling Job—done on the Gorton 9-J Duplicator. 10 elliptical wells—no two the same size—on each of these cylindrical work pieces are rough and finish milled, with beveled edges—simply by combination of Tracer Control, with Automatic Rotation of work and master, geared to table movement—all controlled by one central lever motion.

Blank cylinders come to the Gorton Duplicator, finish-turned. The 10 wells are first rough milled to a depth of .052". Then a finish cut, with the same cutter and spindle speed, removes .010" stock, merely by lowering spindle the required amount. Hand finishing required is almost negligible—due to the excellent finish obtained by the use of 2-flute Tungsten Carbide form cutters—at Gorton high spindle speeds.

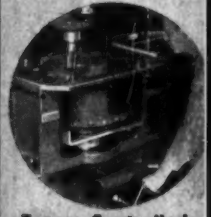
PRODUCTION DATA

Material—S.A.E. 1020 Seamless Steel Tubing.
Operation—Rough and Finish Milling of 10 Wells (varying from 3/4" wide x 3/8" long . . . to 3 5/8" wide x 2" long), .062" deep.
Cylinders—9 9/16" O.D. x 7 25/32" long.
Feed—Manual . . . Spindle Speed—4,000 r.p.m.
Tolerances—±.005".
Time—Roughing 18 minutes; finishing 23 minutes; total floor-to-floor, 43 minutes. (10 wells complete, average 4.3 min. per well.)

ENGINEERING SERVICE . . . FREE

Have the advantage of 50 years of Gorton Specialized Tracer Control Experience in your shop—call nearest Gorton dealer or write to Gorton factory at Racine, Wisconsin.

The *Right* Size The *Right* Type of Machine for Every Job . . .
From 2 oz. to 2 ton



DIE BLOCKS

Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON ARMY E NAVY

GORTON *Precision* MACHINES

CUTTER GRINDERS
ETCHING MACHINES
3 & 5 Dimensional PANTOGRAPHS
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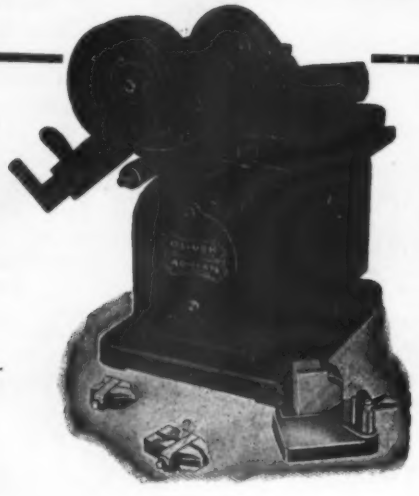
KEEP YOUR DRILLS IN "new tool" CONDITION WITH THE OLIVER DRILLPOINTER!



RIGHT: Oliver No. 510 Drillpointer. Automatic operation produces patented Oliver variable point angles and variable clearances. Quickly set up for drills from 1/4" to 3" dia., for any point angle from 82° to 160°. *LEFT:* Oliver No. 21 Bench Drill Grinder, hand operated, for drills from No. 57 to 1/2". Attachments available for grinding oil hole drills and special points.

Grinds mathematically correct Point that saves Drills, reduces load on Machine, assures efficient Production

Poorly sharpened drills, drills with points off center, with incorrect clearances or unequal point angles, will hold up your production. The OLIVER NO. 510 DRILLPOINTER (upper right) will keep your drills in top-notch condition for long runs of accurate work. Completely automatic cam-controlled action enables even unskilled operators to produce points that are mathematically accurate in every dimension, points that cut clean and accurately, reducing load on both machine and tool. No. 510 quickly set up for all drills from 1/4" to 3" dia., for any point angle from 82° to 160°. See also Bench Drill Grinder, upper left.

Write for bulletin on these useful moneysaving tools.

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Don't Neglect Your Toolroom It's the Backbone of Production!

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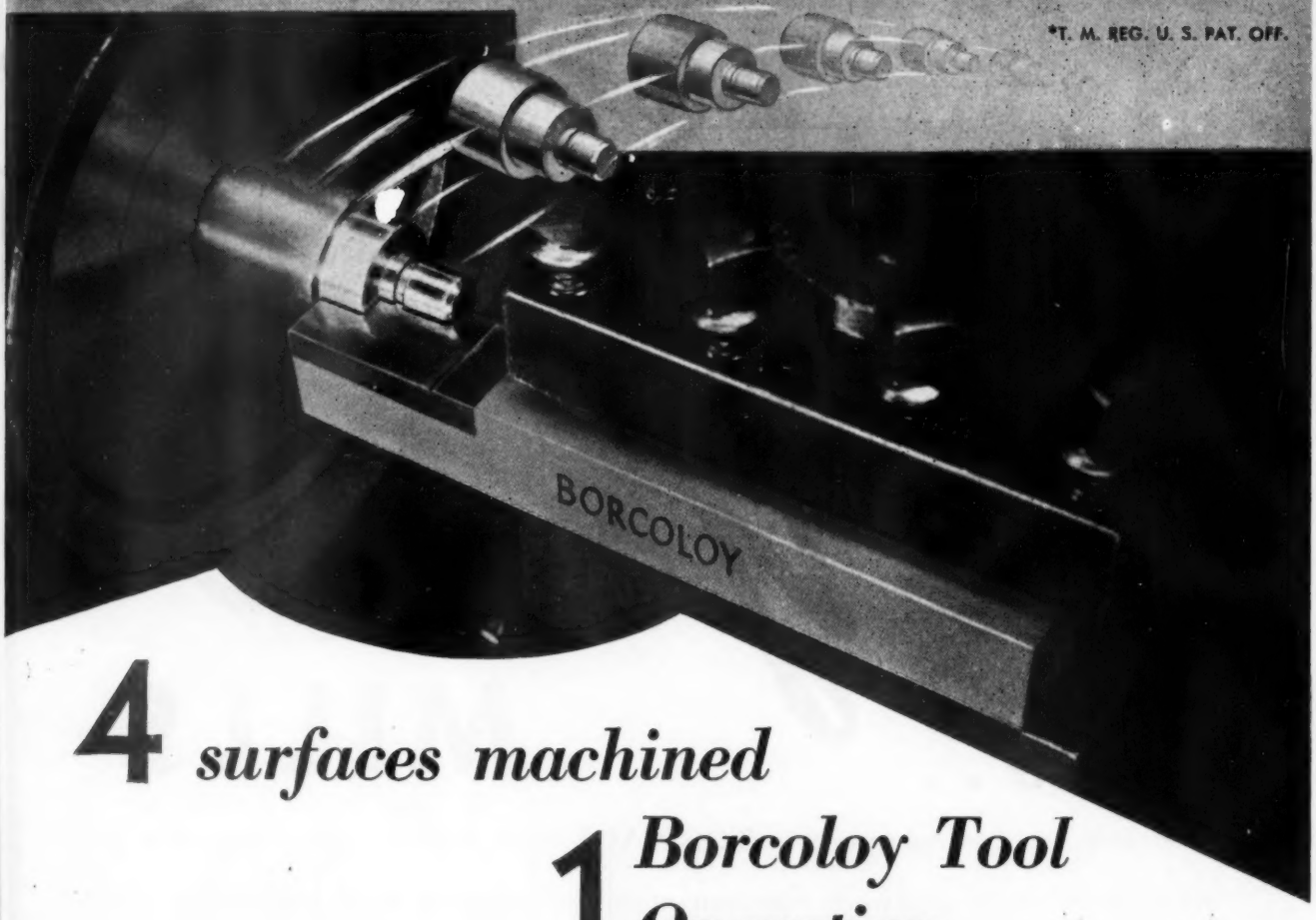
Cut Cutting Costs with

BORCOLOY*

*T. M. REG. U. S. PAT. OFF.



4 *surfaces machined* 1 *Borcoloy Tool Operation*

This NE 8630 Chrome Molybdenum steel "fork", 1.250" in diameter, was formerly machined in four separate operations with complete changes in set-up for turning, facing and cutting. Yet with a BORCOLOY FORM TOOL (ground from a 1" square tipped tool) the daily production has increased 100%. The time now required for the entire job is merely the time for the longest cut.

On regular production runs, operating at 90 S.F.M., .004" feed per revolution and .155" greatest depth of cut, a minimum of 1000 pieces are being machined between tool grinds, thus proving the advantages of BORCOLOY for Form Tooling applications.

BORCOLOY is a centrifugally cast ferrous alloy that incorporates the superior Hardness of heat-treated steel (Rockwell up to C-71) with the "Red Hardness" of Cobalt and the "Wear and Abrasive Resistance" of Boron. A range of 3 grades will thoroughly cover your cutting requirements:

Grade 5 where wear resistance is the principal factor.

Grade 6 for maximum hardness.

Grade 7 to give you high "Red Hardness" for your fast cutting production jobs.

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Tool Division; South Norwalk, Conn.

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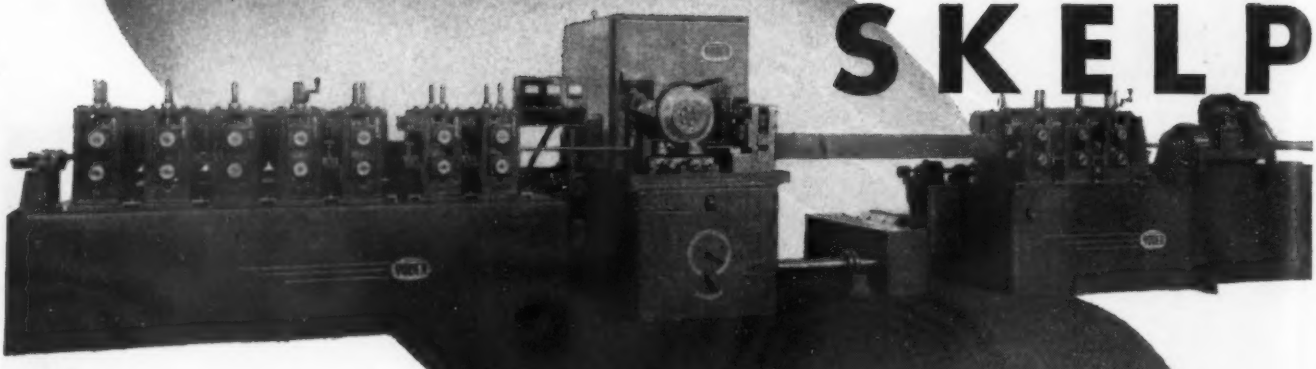

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FOR INDUSTRIAL MACHINES

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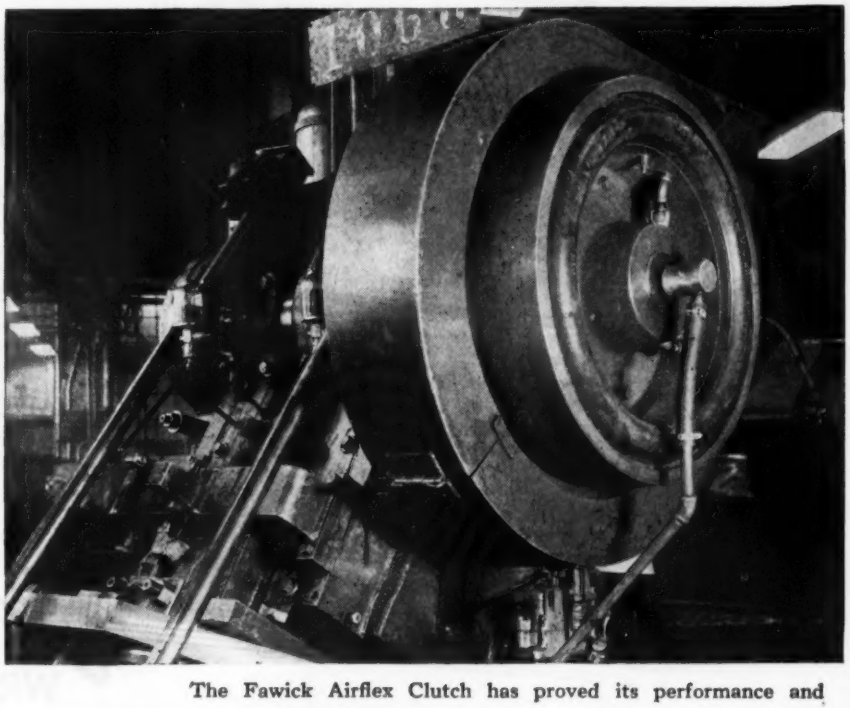
THE FAWICK AIRFLEX CLUTCH provides air-cushion clutch action because it matches today's fine motor vehicle tires in quality of material and excellence of workmanship — the result of the great technical advances made by America's Rubber Industry.



The Fawick Airflex Clutch has proved its performance and economy for all types of heavy machinery—especially presses and punch presses. Acts as *both* clutch and brake.

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The Moline M32 Special Drilling, Boring and Reaming Machine shown here is one of several designs of completely automatic machines for work on aircraft gun turret rings, but it has many features which are applicable to machining problems presented by other kinds of metal parts.

1. It automatically drills and reams groups of four small holes, and at the same time finish bores and chamfers a larger hole located at the center of each group.
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The complete data on this machine will be well worth your looking into. Send for it today.

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Offer: Infinite range of threads and feeds. Easy gear adjustment. Independent motor mounting. Short, direct drive. One control for all threads. Ample power for heaviest cuts. Automatic stop for feeds.

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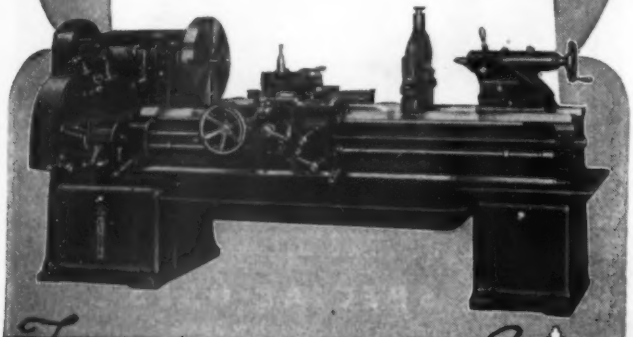

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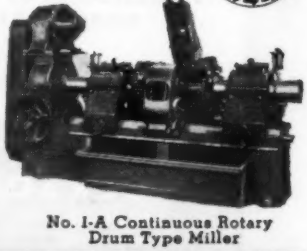
When high production is in demand on your machining problems your requirements can be met with a Horizontal Roto-Matic. Continuous, non-indexing operation together with roughing and finishing spindles insure maximum output. *Bulletins 110 and 120* are available for suggested solutions to your problems.



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ATKINS Silver Steel SAWS
400 A-Z Set
Saw Department of manufacturer ran tests on Atkins "Silver Steel" Curled Chip Powersaw Blades on 3" diameter 4140 steel. Previous cutting time 3 min. per cut; time with Atkins Blades 1½ min. per cut-- 100% increase in production. Previously used 4 to 5 blades per 8-hour shift. Now using one blade every two 8-hour shifts--blade life increased 8 to 10 times.
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Proof that Atkins "SilverSteel" Blades are consistently breaking cutting records is contained in the endless stream of reports like the above... reports from plants in every corner of the country... telling how these blades cut faster, smoother and longer, and save on production costs. More reason for you to get acquainted with Atkins.

100% INCREASE IN PRODUCTION...

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The proof of the pudding is in the eating. And the proof of a hacksaw blade is what it will do in your plant and shop on your kind of work.

If, as in the actual case cited, one blade can be made to do the work of 8 or 10, and double production besides, the benefits are obvious: greater efficiency on metal cutting operations and substantially lower production and tool costs.

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Makers of Better Saws for Every Cutting Job
Power and Hand Blades • Milling Saws • Segmental Cold Saws • Metal Cutting Bands

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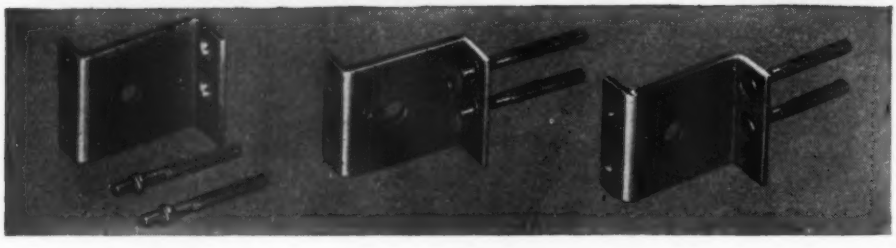

produces Three Hundred Assemblies an hour instead of sixty

FASTENING two bolts to a bracket, with no protruding bolt heads, is now done by electrical upsetting in two simple operations—using Mallory Resistance Welding Electrodes—at rates up to 300 assemblies an hour, as against 60 an hour by conventional methods.

Two threaded bolts are inserted in a lower die made of a Mallory alloy faced with Elkonite*. A bracket, punched with square, countersunk holes, is placed over the bolts and held in position by two locating pins. Upsetting is performed by the upper electrode, also made of a Mallory alloy with an Elkonite face. Heated metal flows into the bracket holes and joins the bolts securely, flush with the bracket's surface. Then the completed assembly is ejected with an air operated stripper.

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Experienced Mallory engineers can help you to determine the techniques of resistance welding best suited to your production. They can aid you in selecting electrodes of the correct alloy—whether you need spot welding tips or holders, seam welding wheels, or dies for flash, butt or projection welding. Consult Mallory today. Write for a free copy of the illustrated catalog on Mallory electrodes.

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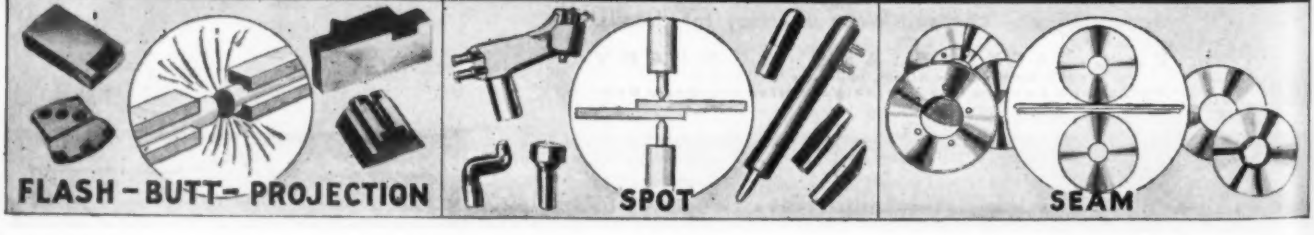
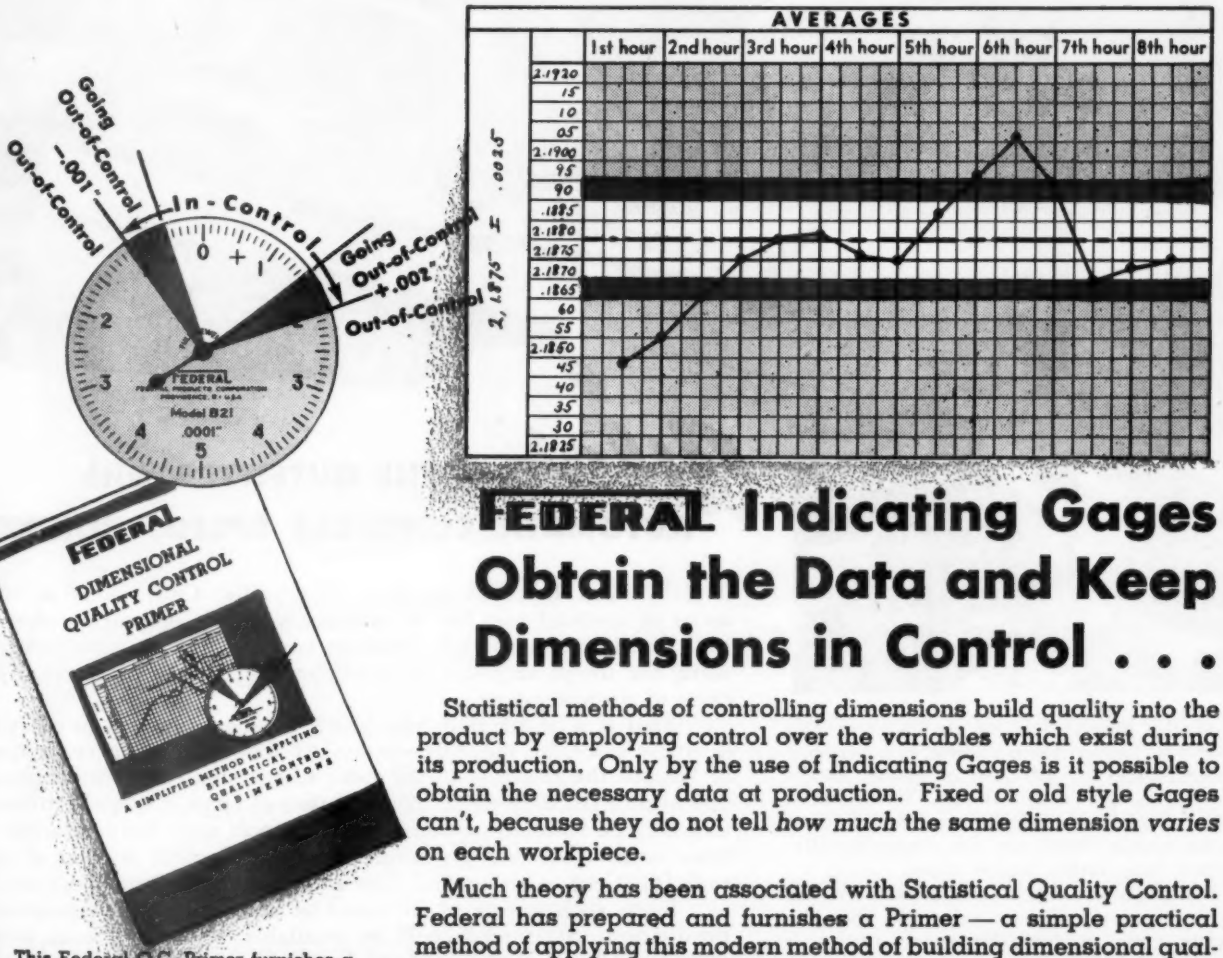
MALLORY Standard Resistance Welding Electrodes



DIMENSIONAL *QUALITY CONTROL

Locks the Barn Door BEFORE the Horse Is Stolen



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DIMENSIONAL QUALITY CONTROL PRIMER
A SIMPLIFIED METHOD for APPLYING STATISTICAL QUALITY CONTROL to DIMENSIONS

This Federal Q.C. Primer furnishes a simple and practical method of *applying* Dimensional Quality Control with the detailed theory eliminated.

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Statistical methods of controlling dimensions build quality into the product by employing control over the variables which exist during its production. Only by the use of Indicating Gages is it possible to obtain the necessary data at production. Fixed or old style Gages can't, because they do not tell *how much* the same dimension *varies* on each workpiece.

Much theory has been associated with Statistical Quality Control. Federal has prepared and furnishes a Primer — a simple practical method of applying this modern method of building dimensional quality into your work at production.

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* *Quality Control by Statistical Methods.*

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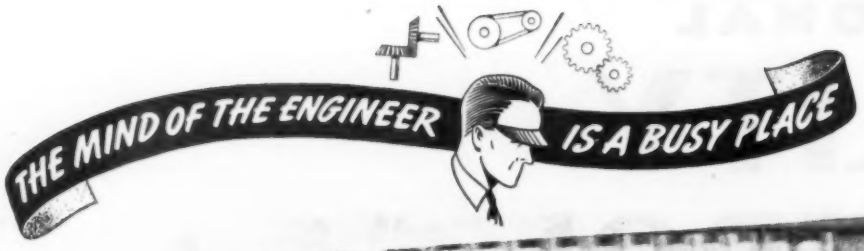
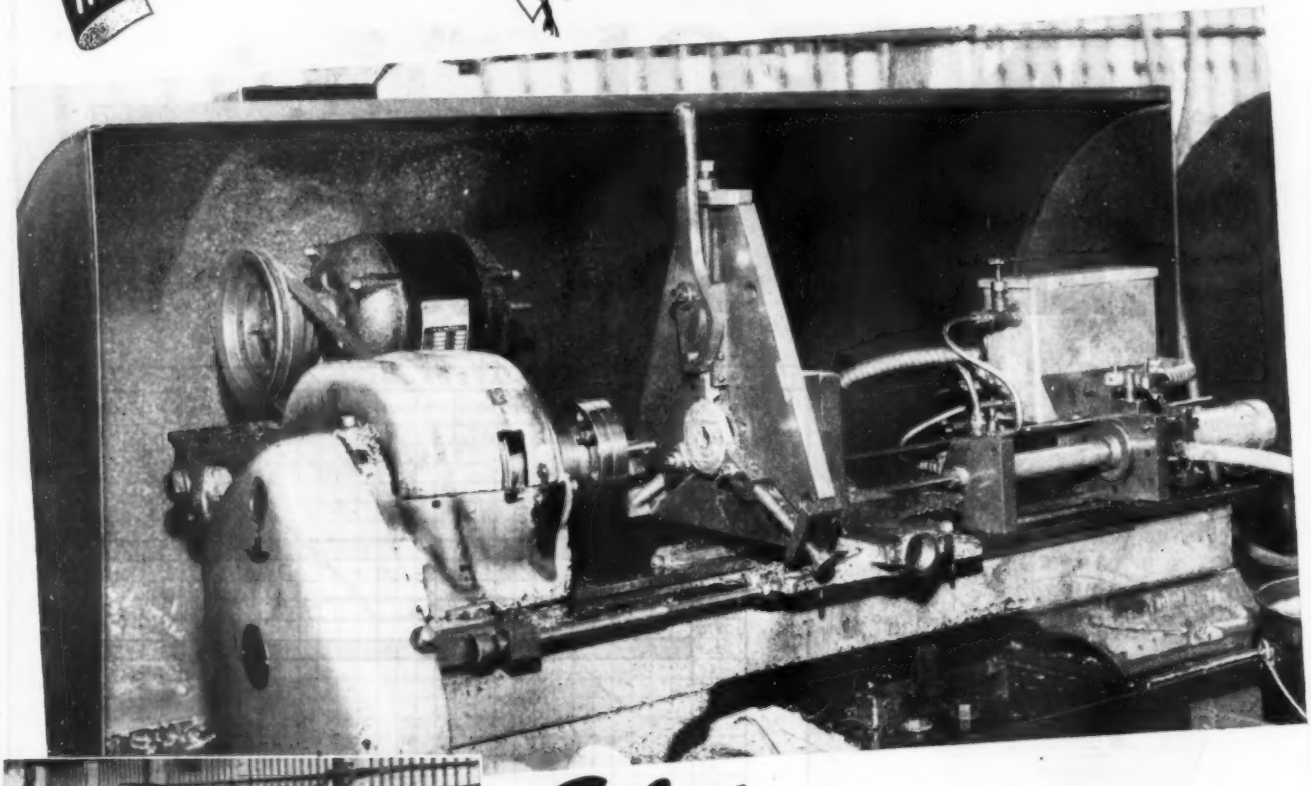
PRECISION GAGING INSTRUMENTS





One of the biggest jobs of the Western Die Casting Co. has been the casting and finishing of cable pulleys for all types of planes, particularly B-17's, B-24's, and B-29's. Well over a million pieces have been diamond bored to an accuracy within .0005" on the three specially-equipped Atlas lathes shown above.

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The lathes are kept going continuously day and night. The only service has been new bearings for the original lathe that has been on the job for three busy years.

Atlas LATHE OUTFITTED with AUTOMATIC CONTROLS SPEEDS BORING

The Western Die Casting Co., Emeryville, Calif. adds to the series of unusual uses for Atlas tools with the adaptation above. Full details are at the left. Perhaps you can use the idea to help solve the tough engineering problem of postwar production at close to prewar prices.

That *is* a problem in any man's language. It will be solved, in many cases, by the Atlas-sponsored war production technique of "match the machine to the job." Check small parts machining operations. Do they waste the capacities of large, costly machines? Can they be handled on compact Atlas tools with lower machine-hour costs? Can you go further and supplement regular Atlas tool functions with special jigs and automatic control devices?

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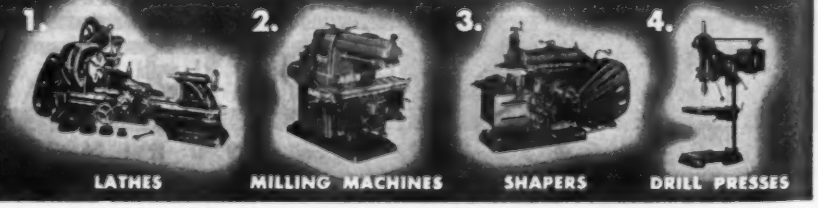
Atlas 4 TOOL TEAM FOR SMALL-PARTS MACHINING



CHECK YOUR SPEED

Call Your DISTRIBUTOR!

Leading distributors in every section of the country carry National Cutting Tools. National distributors offer factory trained engineers to serve you. Call your National distributor for cutting tools or any staple industrial product.

MILLING cutter speeds should be correlated with rates of feeds and depths of cuts. Speeds and feeds should be adjusted to provide correct chip thickness per tooth.

Speeds that are too high may be destructive to cutting edges of high speed steel metal cutting tools. National cutting tools will give higher production with longer tool life because they are made to quality standards from selected steels by experienced craftsmen.

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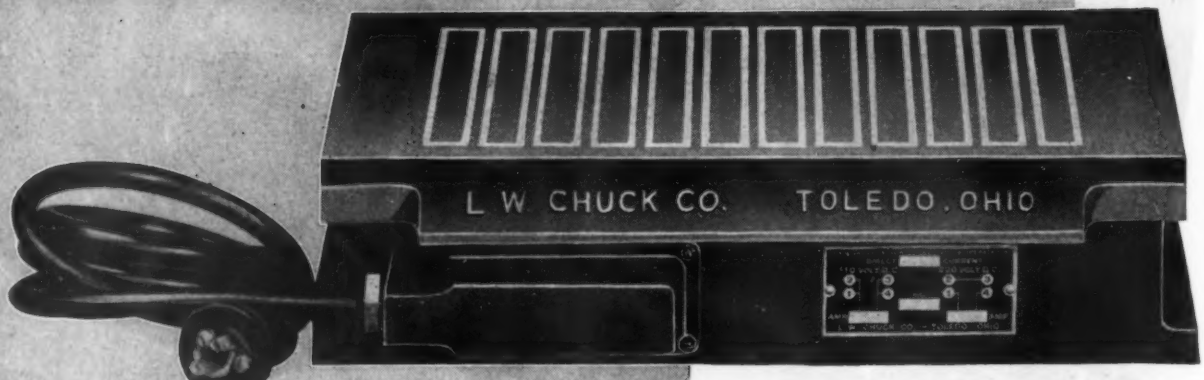
L-W Magnetic Chucks



● Guaranteed maximum holding power, constructed for long life, water-proof for wet or dry grinding. These plus-features combine with scientific design and highest grade materials to offer positive assurance that L-W Magnetic Chucks will meet all requirements and conditions. L-W supplies Magnetic Chucks in four sizes, equipped with connections to operate on either 110 or 220 volt D.C.

Size 5¾" x 13"	$ 47.65
Size 6½" x 18"	63.15
Size 8" x 24"	109.30
Size 10¾" x 37"	202.50

DEMAGNETIZERS

Model B-2 working surface 7¾" x 12½" x 6¾"....$63.20

Model J-1 working surface 7¼" x 7¼" x 6¾".....$41.15

RECTIFIERS

Converts A.C. into D.C. A.C. input 110 volts. D.C. output 110 volts, 8 amps. Suitable for use with our 5¾" x 13" and 6½" x 18" magnetic chucks. Price $38.75. Larger capacity rectifiers available.

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Field discharge type $16.25

L-W Demagnetizing Switch..... $8.90

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

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For Mr. Webster's dictionary . . .

A new definition of fidelity

fi·del'ity (fi·del'i·ti), *n.*; *pl.*—TIES (-tiz). [F. *fidelité*, fr. L. *fidelitas*]. **1.** Faithfulness; adherence to right; careful and exact observance of duty, or discharge of obligations. **2.** *Elec.* The degree to which an electrical device, as a radio receiving set, accurately reproduces at its output end the signal or wave forms received at its input end.

3. *Industry.* That degree of permanent dimensional accuracy through resistance to wear as demonstrated by Elgin-made Sapphire Gages.

INSTANCES:

At Stewart-Warner Corporation—an Elgin Plug Gage, showing less than .00001 inch wear, has delivered over 220,480 close tolerance gagings on a job which wore out *steel* gages, formerly used, after only 300 gagings!

An Elgin *Ring* Gage at the same plant, checking a shaft charged with grinding compound, has now exceeded 328,950 gagings against 150 pieces for high speed steel and 500 for tungsten carbide.

At American Perforator Company—an Elgin Plug Gage, still going strong, has delivered some 520,000 close tolerance gagings over a 14-month period on parts which wore out *steel* gages after only 1 day!

Elgin Sapphire dimensional fidelity saves man-hours, materials, money!

In plant after plant, wherever they are used, Elgin Sapphire Plug and Ring gages are setting new and almost unbelievable records for resistance to wear.

Chemically inert at normal temperatures, their rugged gaging elements of brilliant sapphire do not rust, corrode, burr or become distorted with use.

Approaching the absolute in dimensional fidelity, Elgin Sapphire Gages help eliminate the waste of worn-gage rejects; thus they save man-hours, money and materials.

Elgin Plug Gage sizes: from .030″ to .400″ and with tolerances as close as XX (± .00001).

Elgin Ring Gage sizes: from .004″ to .250″ and in tolerances from .00020″ down to .00004″.

Data on larger sizes, other gaging items, and prices on request.

America's best equipped Sapphire Fabricator

ELGIN NATIONAL WATCH COMPANY
Sapphire Products Division
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Elgin Sapphire products present many advantages for all these types of equipment: GAGES · THREAD GUIDES · EXTRUSION DIES · KNIFE EDGES · SPRAY NOZZLES · SOFT WIRE DIES · BURNISHING TOOLS · PRESSURE VESSEL WINDOWS · WATCH CRYSTALS · HONING STONES

★ ELGIN ★
Sapphire Gages
DIMENSIONAL FIDELITY IN GAGING OPERATIONS

For Many a Tight Spot

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MOUNTED WHEELS
MOUNTED POINTS

Use them in all kinds of high speed grinders, air, electric and flexible shaft.

Use them on any kind of materials from the hardest steels to plastics.

Use them for precision work or off-hand grinding.

SEND FOR SPECIAL CATALOG
of Abrasive Company Mounted Wheels and Points

ABRASIVE

For grinding and finishing in close quarters ABRASIVE COMPANY mounted wheels and points often do a better job, faster and at lower cost.

A wide range of sizes and shapes from a point as small as a kernel of wheat to a wheel 2" in diameter, and many a variety of grain and grade combinations meet thousands of requirements. Stainless steel mandrels from 3/32" up to ½" in diameter and lengths up to 3" add to the adaptability of these efficient tools.

Abrasive Company Mounted Wheels and Points; and Victory Points with demountable spindles are made according to the same high quality, laboratory controlled, scientifically tested standards which make all Abrasive Company products the choice of discriminating buyers and users.

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Division of Simonds Saw and Steel Co.

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They GRIND FAST – AND LAST!

Speedier grinding from wheels that last longer is the usual result when Sterling's "Wheels of Industry" are on the job.

Tailor-made to the demands of any type of work, Sterling Wheels are the economical solution for all grinding problems . . . there is a wheel size and shape, grain, bond, and structure for *your* jobs.

FREE—For the Asking!

Send today for your copy of the Sterling Specification Selector . . . the handiest pocket file you have ever seen . . . full of specifications for all kinds of grinding jobs. . . . . .

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THE
STERLING GRINDING WHEEL DIVISION
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THE WHEELS OF INDUSTRY

Save Time, Materials and Money

DRAFTO

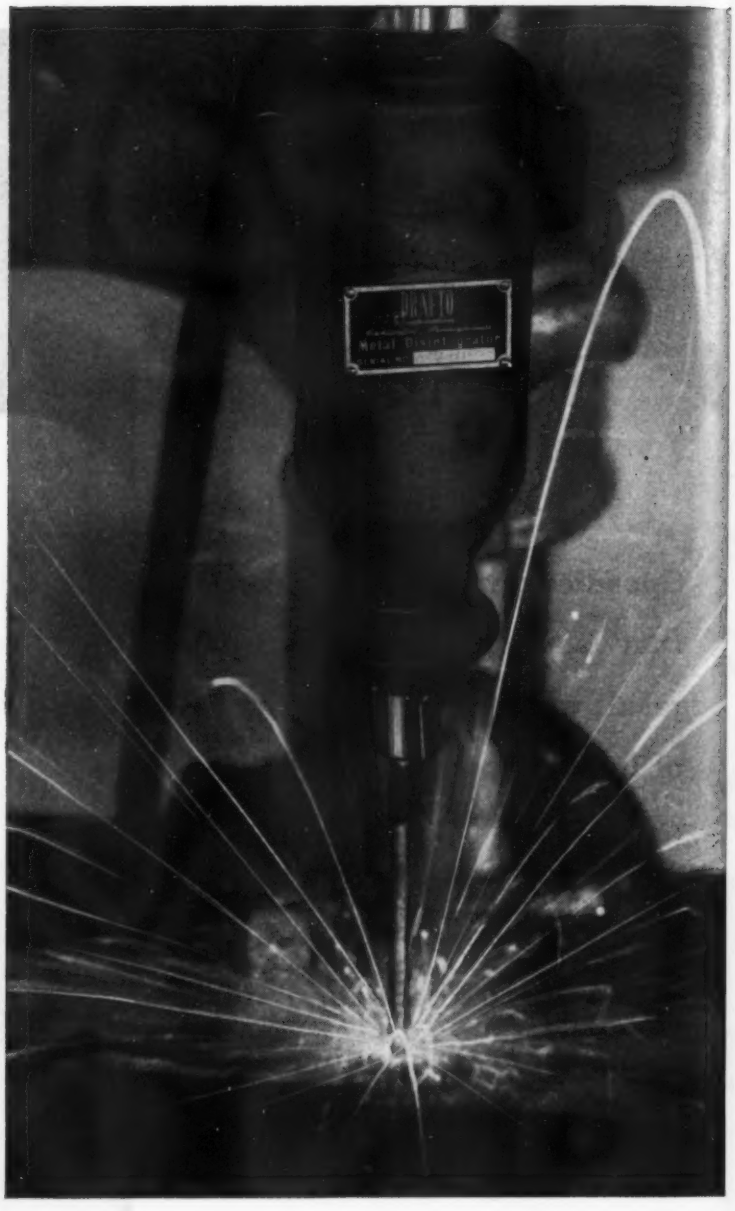
METAL DISINTEGRATOR

For Removing Embedded Taps, Drills and Tools

Portable, Compact

COMPLETE WITH COOLANT TANK, PUMP AND SUPPLY OF ELECTRODES

$295.00



● *Embedded taps are removed by disintegrating the core and lifting out flutes; drills by disintegrating the web. Disintegration occurs only where the electrode touches the metal. No excessive heat, no pressure, no damage to finished surfaces.*

ON intricate work where much time has gone into a piece the Drafto Metal Disintegrator can pay for itself on the very first job, but it's not only on high value pieces that it proves its worth. You'll use Drafto to remove broken taps and drills in ordinary production pieces; you'll find it handy in taking out hardened pins. You'll disintegrate a square hole and back out studs, you'll form openings in tungsten carbide where needed. You'll find many jobs for the efficient, portable, completely self-contained Drafto Metal Disintegrator. Manufactured by Drafto Corporation, Cochranton, Pennsylvania

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WALTER J. GREENLEAF *Company*

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HOW A DISSTONEER SOLVED THE CASE OF THE TRANSFORMER COILS

Cutting transformer coils—with their windings of paper, wire and cardboard cores—is considerably harder than it would seem, as one manufacturer discovered. The machine he was using was equipped with serrated edge band knives, which had a habit of breaking after only about 36 cuts. Then the machine would be shut down for 10 minutes while another band knife was installed.

A Disstoneer*, after examining the set-up, saw that the bands were too heavy for the small diameter wheels. Also the knife was not the type best suited for the work. Thinner bands, with toothed and serrated edges, were recommended. Breakage was eliminated entirely, work proceeded without further interruptions and production was speeded up.

Another clear-cut case of Disston leadership

ESTABLISHED 1840 TRADE MARK REG. U.S. PAT. OFF.

***DISSTONEER**—a man who combines the experience of Disston leadership and sound engineering knowledge, to find the *right tool* for you—to cut metal, to cut wood and other materials—and TO CUT YOUR COST OF PRODUCTION—*not only on special work, but on ordinary jobs as well.*

You may have no need for band knives of the character recommended, but no matter what you manufacture, you most likely use files, and will be interested in knowing about—

DISSTON BITE-RITE FILES

A greatly improved type, with distinctive features of importance to all file users. Teeth are extra strong and sharp; they are staggered for straighter, faster and smoother cutting. You can count on them for long, dependable service. Disston Bite-Rite Files are supplied in all standard cuts, shapes and sizes—and for all materials. Write for full particulars.

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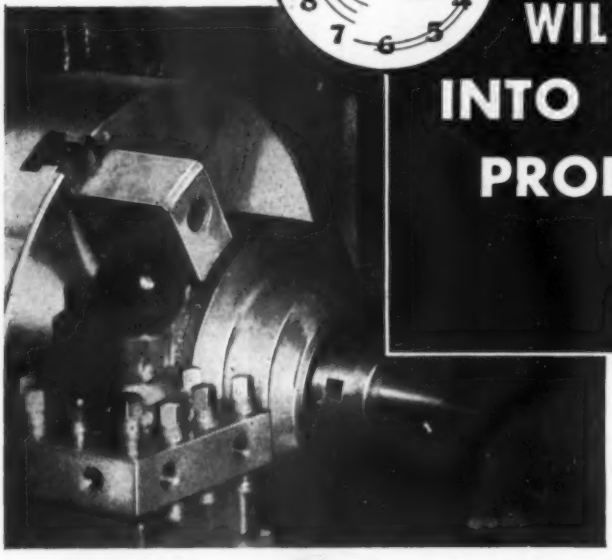


HOW *FAST* WILL YOU GET INTO POSTWAR PRODUCTION ?

While you continue peak production of war materiel, you can take steps — now — toward getting into production on civilian goods *quickly* when reconversion comes.

You undoubtedly know what your new peace-time product will be. By considering its production requirements now — and letting our engineering department study the work-holding problems involved — you should be able to get into production weeks, perhaps even months, sooner.

YOUR COMPETITORS ARE PLANNING NOW

Civilian production will require you to machine work of shapes far different from those you have been handling. Cushman engineering can provide special work-holding devices that will help you toward high accuracy, high volume production at low unit costs.

If your chucks have been running a war-paced 168-hour week, they probably need replacement or repair.

Whatever your work-holding problem, consult our engineering department freely. A tremendous fund of information is at your disposal, and we are ready and eager to help you.

THE CUSHMAN CHUCK CO.
HARTFORD 1, CONN.

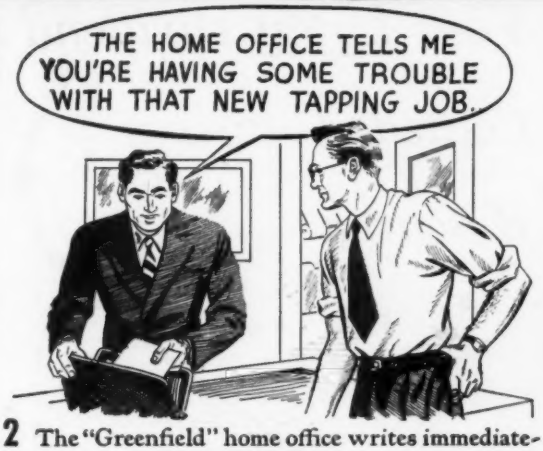
A WORLD STANDARD FOR PRECISION

CUSHMAN CHUCKS

TAPPING TROUBLE? TYPICAL CASE SHOWS HOW ALERT "GREENFIELD MAN'S" QUICK SERVICE SOLVES PROBLEM

A GTD SHOW-HOW REPORT!

1 A small southern plant, wrestling with new war order calling for close threading tolerances, was having trouble getting Class 3 fits. In re-ordering taps from "Greenfield," they mention problem in foot-note on the order, wondering if job calls for a "special" tap.



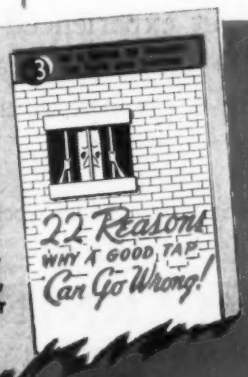
2 The "Greenfield" home office writes immediately for complete data needed to help customer with problem. Copy of correspondence automatically goes to "Greenfield Man" in customer's territory. "Greenfield Man," familiar with customer's tapping operation, suspects something other than the tap is causing the trouble. He visits plant immediately.

3 Customer shows him the tapping operation which is causing the trouble. "Greenfield Man," checking various factors which might affect accuracy, discovers tap and work are out of alignment, and suggests how to correct trouble.

4 Result . . . customer is able to get Class 3 fits with no difficulty and without the "special" taps he thought might be needed. His problem is solved—in a few days—thanks to alert, resourceful service from "Greenfield's" field organization.

Are You Using "GREENFIELD" SHOW-HOW Literature?

For example—this folder on "22 Reasons Why A Good Tap Can Go Wrong." Here is valuable information for your employees. Order a supply from your "Greenfield" Distributor today. And if you need help on a threading problem, call on your "Greenfield Man" through your "Greenfield" Distributor.



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Your Latest Dividend From Coated Abrasives Research*

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Its rock-hard adhesive bond, much more resistant to operating heat, much less sensitive to humidity, gives 25% greater output at no increase in price.*

If you have not yet experienced the outstanding advantages of DURABONDED Coated Abrasives, get in touch with our nearest branch for a prompt demonstration on the toughest job you can select.

*This is a modest average. Many reports in excess of this figure are on file.

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COME war or peace, stainless will always be a critical material *in the shop.* You'll want to keep rejects and spoilage low, as well as machining time and cost—and there are ways to do it.

Cutting speeds can't be as fast as with carbon steel or low alloys. Tools should be high speed steel or carbide-metal tipped, with a generous rake and a chip breaker, if possible. Keep them sharp, and don't allow the tool to ride on the work, to avoid work-hardening.

More important, check the design of the cutting tool itself, and check the possibility of using one of the special easy-machining grades of Allegheny Metal. Let us help you also to select the right cutting tool from our complete range of High Speed Steels, ALX Cast Alloy Bits and Carmet Carbide Tools.

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Keeping Navy searchlight reflectors spotlessly clean is an unending job. The HAYNES STELLITE alloy, from which many reflectors are made, is so hard that constant cleaning and polishing will not mar its surface.

LIGHT ON THE RISING SUN

UNCLE SAM'S NAVY has the most efficient searchlights on the Seven Seas. They are so powerful that one of them measuring 24 inches across can shoot a beam of light through 23 miles of inky darkness.

The reflectors of these searchlights are made of an alloy perfected and produced by HAYNES STELLITE COMPANY.

The Navy is using HAYNES STELLITE alloy for several reasons. It will not shatter from shock of gunfire. It has high resistance to corrosion by salt air, salt spray, powder and sulfur fumes. It withstands the terrific heat of the arc light—and hot particles of copper and carbon from the electrodes do not cause it to pit and lose its reflectivity. Searchlight reflectors are indicative of the many applications to which HAYNES STELLITE alloys — with their unique combinations of properties — can bring more efficient performance.

•

HAYNES STELLITE alloys have long been used for scientific mirrors, surgical and dental instruments and other equipment requiring great resistance to corrosion, wear and heat. Unending research is constantly adding to the variety of these alloys. They can be produced in many exacting shapes—in quantity—and delivered ready for assembly without further finishing.

A booklet describing the properties of Haynes Stellite alloys is available on request.

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"HAYNES STELLITE" is a registered trade-mark of Haynes Stellite Company.

highest production potentials

METRO

Tools and Gages

In the production race—war and post-war—the tools with the highest production potentials are the only ones that deserve consideration by production men.

Metro Precision Gages and Carbide Tipped Tools are produced by sound engineering, long experience and skilled craftsmanship to insure just such a margin between what you must have and what it is possible to get out of your tools. Metro meets your most exacting needs. Ask your Metro distributor, too, about Metro service in making up tools and gages for special applications.

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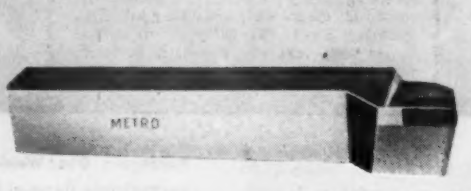
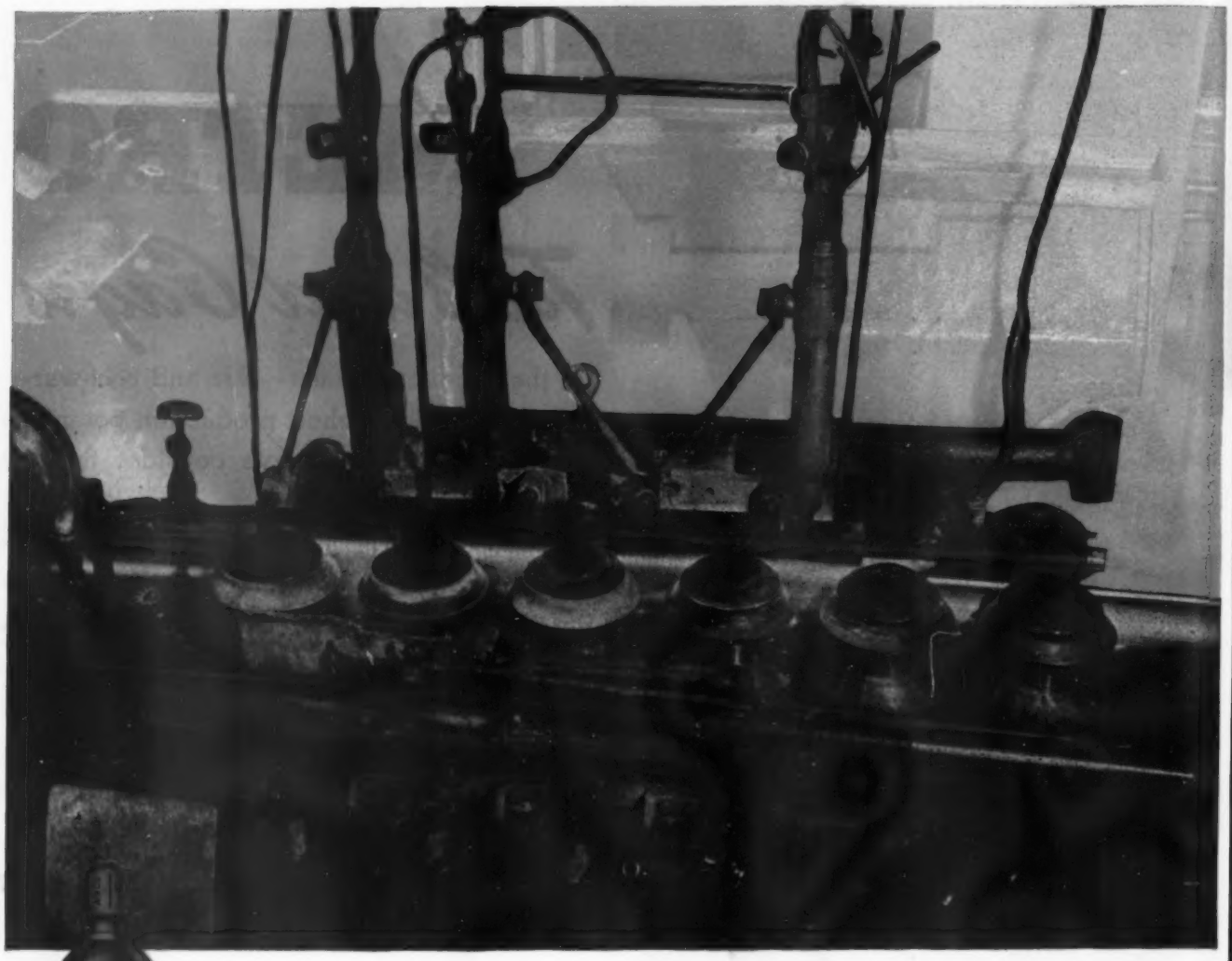


METRO TOOL AND GAGE CO.
4240 Peterson Avenue
Chicago 30, Illinois

Airco Processes Help Produce



Automatic Gas Welding. The oxyacetylene flame at the welding rolls heats the skelp for butt welding this thin wall tubing. No costly furnace is required. Heat is confined to the area adjacent to the weld. Temperature is constantly controlled insuring welds of highest quality and uniformity.

IN HUNDREDS of plants throughout the country, Airco has teamed with metallurgists and production men to help produce better parts faster — through the use of Airco processes and products.

These developments have contributed much to the quantitative and qualitative superiority of American armament. Together with others on which metal-wise Airco engineers are engaged, they hold great promise for post-war metal-working.

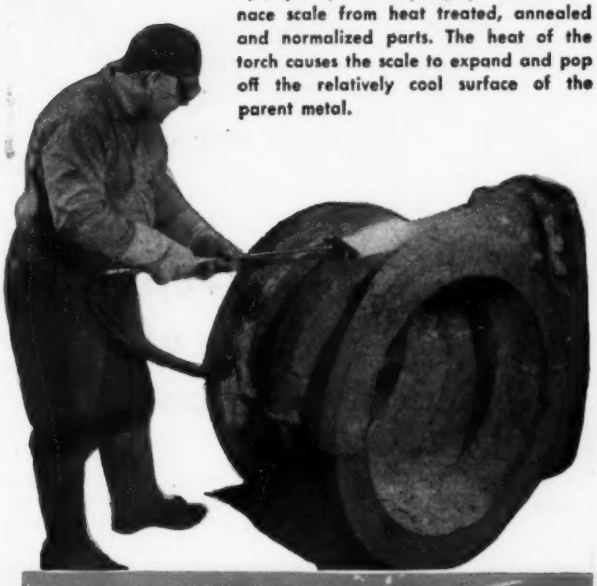
Airco's Applied Engineering Department will be glad to assist you in the application of these processes to your own production — or in the development of new processes to suit your needs. Just get in touch with your nearest Airco office.

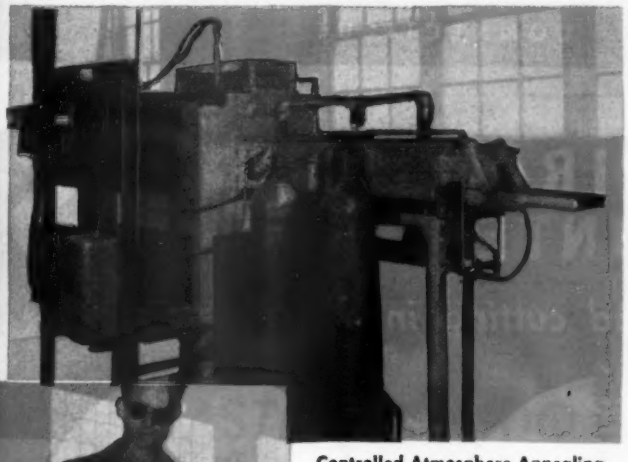
AIRCO

Better Metal Parts Faster

Flame Hardening. Using special flame hardening tips, as in the case of this gear, surface hardening can be confined to areas of parts subject to wear or abrasion. Quench spray follows immediately after the heating torch reducing time at heat to the minimum. Warpage is minimized and grain structure and ductility of untreated areas are unchanged. Using a slightly carburizing flame, surface decarburization is held to a minimum and little or no finishing after hardening is required. (Note even penetration of hardness in the photo above.)

Flame Descaling. This simple Airco process, using the oxyacetylene torch with special tips, quickly and thoroughly removes furnace scale from heat treated, annealed and normalized parts. The heat of the torch causes the scale to expand and pop off the relatively cool surface of the parent metal.





Controlled Atmosphere Annealing. Use of Airco high-purity nitrogen in controlled atmosphere annealing of metals of all kinds assures highest satisfaction.

Flame Heating for Bending. The oxyacetylene torch with special multiple heating tip presents unlimited possibilities for heating metals for bending and otherwise shaping where suitable furnace equipment is not at hand.

Flame Spinning. In spinning this bomb, the heat of the oxyacetylene flame keeps the metal at proper plasticity throughout the forming operation.

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Assuring Speed-up on a wide range of Indexing Operations

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Send at once for illustrated literature describing the Hartford Super-Spacer.

Milling, drilling (plain and radial), grinding, planing, slotting and jig boring operations are being greatly speeded up and accuracy of indexing maintained through the use of this modern, simple, and easily operated spacing device. Only the holding capacity of the SUPER-SPACER and the power of the machine on which it is used limit cutting speeds and feeds.

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Attachments are available for use with the standard Super-Spacer which still further increase its utility. It will pay you to get full information on the applications to which the Hartford Super-Spacer is adapted.

THE HARTFORD SPECIAL MACHINERY COMPANY

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CARD SPIRAL POINTED TAPS

for free, accurate thread cutting in deep holes

Three Fluted

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Designed for tapping deep through holes or blind holes drilled deeply enough for chip clearance at bottom of hole. Cutting is done by the first few threads milled at an angle. Chips are forced ahead of tap, preventing chips clogging in flutes, thereby increasing strength of tap and minimizing chances of breakage.

CARD SPIRAL POINTED TAPS assure free cutting, and fine quality threads. Furnished in carbon steel and high speed steel types. Fully described in Card Catalog, available promptly on request.

CARD TAPS ARE SOLD BY LEADING DEALERS EVERYWHERE

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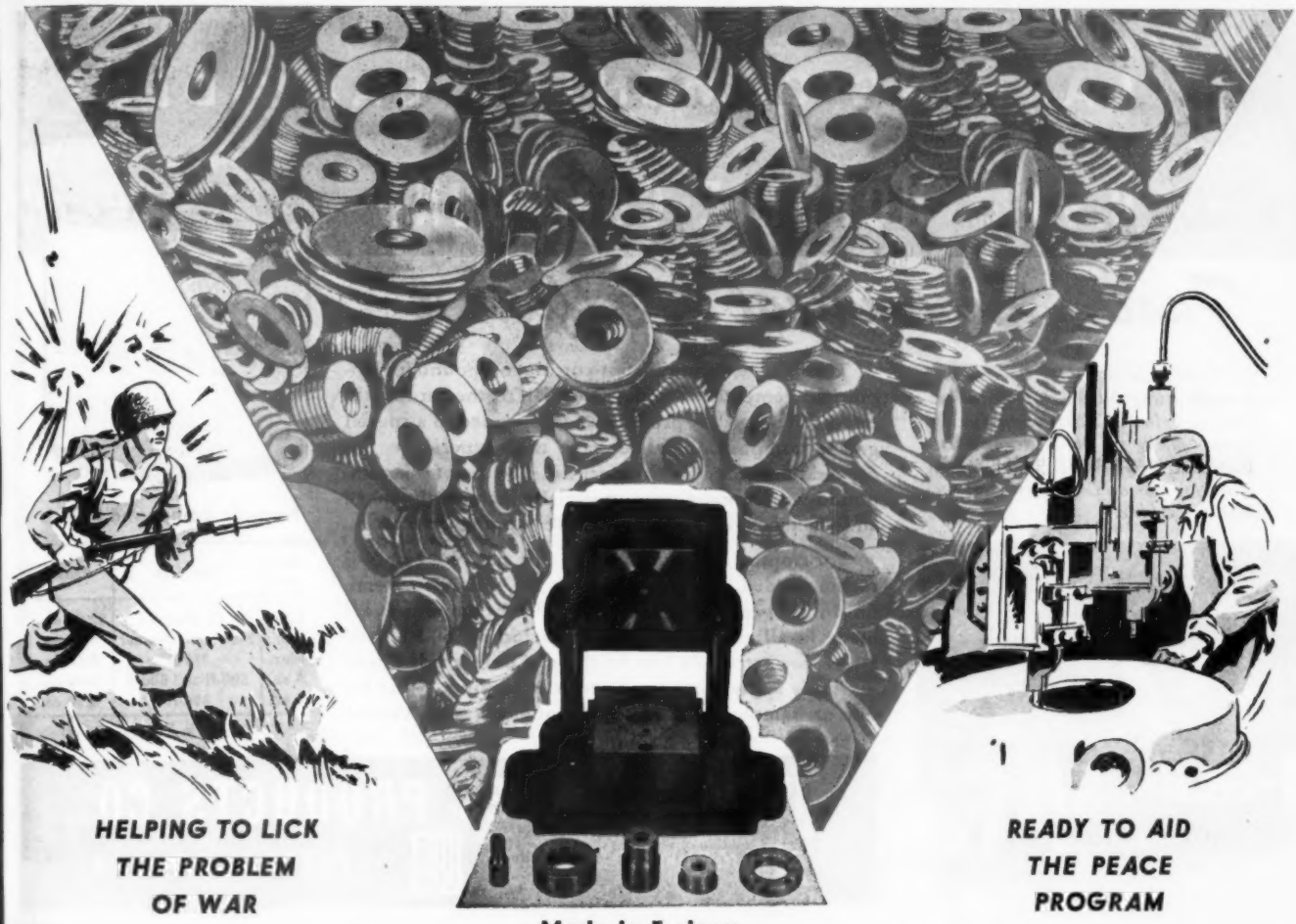

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THE MASTER DIES DO NOT BECOME OBSOLETE

● The Hovis method of making washers has been widely adopted during the wartime program and its use will continue in increasing measure when peacetime production is resumed. Outstanding manufacturers recognize its great advantages in eliminating process engineering, tool-designing, tool-making and tool try-out, and the saving of time, storage space, material and labor.

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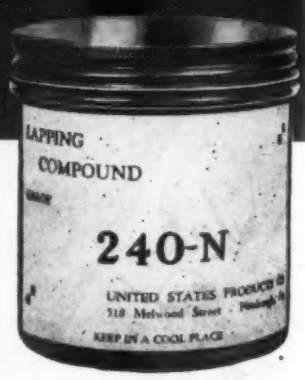

Fast . . Economical . . Efficient . .

USPCo NORBIDE Compound is made using NORBIDE abrasive shown below. This abrasive is second only to the diamond in hardness. NORBIDE is the trade mark for Norton Company's Norton Boron Carbide.

This is an economical, fast-cutting compound for lapping the cemented carbides. NORBIDE, the hardest abrasive commercially produced, is suspended in a special grease composition paste base that experience has proved best suited for this purpose. The use of this compound will, in most cases, materially increase the speed and efficiency of cemented carbide lapping operations.

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1 oz.	All Grades	$2.00 ea.
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8 oz.	320-N	4.50 ea.
8 oz.	500-N and 600-N	6.00 ea.
8 oz.	800-N	8.50 ea.

Prices: F.O.B. Pittsburgh, Pa.

UNITED STATES PRODUCTS CO.

518 MELWOOD ST. USP PITTSBURGH, PA.

Vitrified Wheels

VITRIFIED

. . . for

intricate precision grinding or coarse heavy work

Inasmuch as Vitrified manufactures a complete line of Grinding Wheels in numerous grades, grain combinations and bondings, it is merely a matter of selecting the right wheel for the work to be handled.

Because of this wide selection, a Vitrified Wheel can be depended on for economy, speed and long life in the specific service for which it is intended.

Whether your work involves roughing, finishing, surfacing, edging, or cleaning, hand, automatic or swing grinding, there is a Vitrified Wheel which will give you maximum service at minimum cost.

Why not call in a Vitrified representative to show you how you can make worthwhile saving in your grinding operations?

VITRIFIED WHEEL CO., WESTFIELD, MASS.

How to apply API Precision Standards

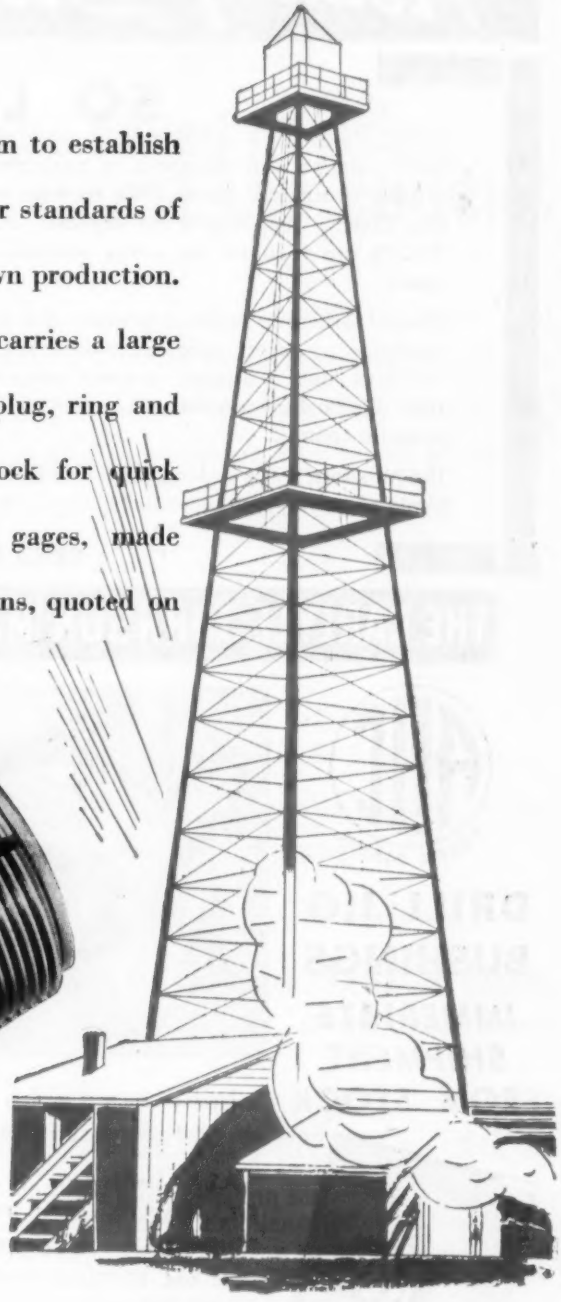
to your production

Careful planning and straight thinking by The American Petroleum Institute have combined to standardize precision throughout the important Petroleum Industry—with the highest uniform standards in any industrial field.

PM Gages have the seal of API acceptance. You can rely on their accuracy and their perfection of finish.

You can use them to establish and maintain higher standards of precision in your own production.

Pipe Machinery carries a large stock of standard plug, ring and thread gages in stock for quick shipment. Special gages, made to your specifications, quoted on request.



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Floating Disc CLUTCHES

SO LONG LIVED

With parts so well designed, so accurately machined, so scientifically processed, there's little to wear in a Maxitorq Multiple Disc Clutch. Simplicity is the keynote . . . so much so that NO TOOLS are required for either assembly, adjustment or take-apart.

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The Maxitorq will give long service without trouble, with minimum waste of power, with utmost efficiency of operation.

DOUBLE TYPE CLUTCH

Submit your clutch problems . . . 1/4 to 5 H.P. at 100 R.P.M. . . . to our engineers for solution. Special sizes to order.

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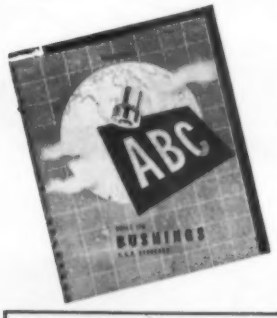

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A.S.A. Standard in HEAD PRESS FIT, HEADLESS PRESS FIT, FIXED RENEWABLE, SLIP RENEWABLE types and HEADLESS LINERS. Also complete accessories.

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Kindly send me FREE catalog describing A.B.C. Drill Jig Bushings.

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THEY SAVED 80% ...

YES . . .
80% of Production Time was saved by using CORTLAND SEGMENTS in CORTLAND CHUCKS

Cortland Chucks and Segments went into the gun mount plant of a famous tire manufacturer and proved that the right kind of grinding can remove .193 stock faster than milling; much faster, in fact.

Here's the brief convincing story of the test:

Work: Gun mount bearing cap.

Material: Drop forging.

Surface Area: 3 sq. in.

Table Load: 50 pieces.

Machine: Blanchard #18 Vertical Surface Grinder. *Wheel Speed:* 750 R.P.M.

Results: The milling operation formerly used consumed 2 minutes per piece. Cortland Chucks and Segments grind 50 pieces in 19½ minutes—an average of 23½ *seconds* each—a saving in production time of more than 80%!

Cortland Chucks and Segments are performing in amazing fashion for hundreds of war production plants. Perhaps they can save time and money for you—while improving the quality of your output. Write for latest illustrated bulletin, giving the complete Cortland story—including the results of many interesting grinding products tests.

CORTLAND GRINDING WHEELS CORP.
5 Cortland Street **Chester, Massachusetts**

Diagonal Shearing with Varying Contact Means Better Surface Grinding

A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

CORTLAND
Chucks and Segments

The $45.15 check that earned $1,059

When time means money, Air Express *earns* its weight in gold as thousands of companies, large and small, have learned.

For instance, a Midwest manufacturer must retool almost in a matter of hours or lose a contract for a new radio part. So he wires Connecticut for new tools via Air Express and has them in the morning. He pays $45.15 Air Express charges, but makes over $1,000 on the contract he saves.

Specify Air Express—High Speed for Low Cost

To prevent tie-ups or shutdowns, save man-hours, gain production time, serve customers — these are some of the reasons why you will find the speed of Air Express economically important.

Shipments travel at a speed of three miles a minute between principal U. S. towns and cities, with cost including special pick-up and delivery. Same-day delivery between many airport towns and cities. Rapid air-rail service to 23,000 off-airline points in United States. Direct service to scores of foreign countries.

AIR MILES	2 lbs.	5 lbs.	10 lbs.	25 lbs.
250	$1.04	$1.25	$1.57	$2.63
500	$1.11	$1.52	$2.19	$4.38
1000	$1.26	$2.19	$3.74	$8.75
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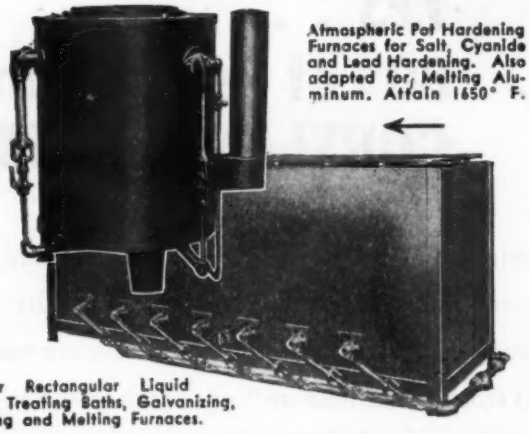
NO BLOWER or POWER NECESSARY
. . . just connect to gas supply



Atmospheric Pot Hardening Furnaces for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum. Attain 1650° F.

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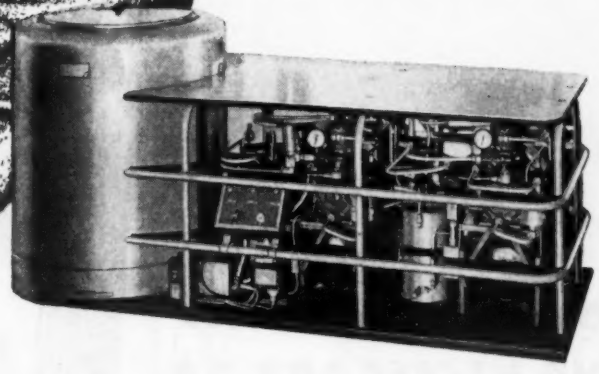
FACTS PROVE

that you need Cold Treating in your plant

Records Submitted by *Deepfreeze* Users Establish Cold Treating as a Time-saving Aid to Low Cost, Quality Production



OPERATION	PART	PERFORMANCE PRIOR TO COLD TREATMENT	PERFORMANCE FOLLOWING COLD TREATMENT
HARDENING	High Speed Drill	48 holes per grind	256 holes per grind
	Tap	40 pieces per grind	500 pieces per grind
	Milling Cutter	7 hours per grind	24 hours per grind
STABILIZATION	Pump Plunger	Operation unsatisfactory due to metal growth.	Perfect operation indefinitely, due to complete stabilization.
	Gauge Blocks	Blocks expanded and warped.	Blocks held original size and shape.
	Lapping Flats	Resurfacing required every 2 to 3 hours.	Resurfacing required every 2 to 3 days.
SHRINK-FIT	Airplane Landing Struts	20 minutes required for assembly.	10 minutes required for assembly.
	Tapered Roller Bearing Race	½ hour to insert in casting.	½ minute to insert in casting.

These performance records are typical of economies obtained in many of the nation's leading industrial plants by the use of Cold Treating in various production processes—economies which can be duplicated under similar conditions in your plant.

Cold Treating is used to accomplish a variety of purposes—all with equal efficiency and economy. Foremost among these are hardening metals and metal parts; stabilizing precision parts, gauge blocks, lapping flats, etc.; shrinking metal parts for rapid assembly; and testing of instruments and equipment for high altitude, low temperature operation. In addition, Cold Treating is performing a multitude of specialized operations too numerous to mention.

You, Too, Can Profit by Using Cold Treating

Whatever your production, a survey of the outstanding results obtained by applying sub-zero temperatures to industrial operations—a few of which are shown in the panel at left—is convincing proof of the economical value and utility of this newest "tool" for industry. Think what such results can mean to your operations in terms of production economies and improved quality of your product.

Let Deepfreeze Engineering Service Assist in Adapting Cold Treating to Your Production

If you are unfamiliar with industrial Cold Treating or are using it on a limited scale and are interested in increasing its range of utility, contact Deepfreeze Engineering Service. Our experienced refrigerating engineers will make a complete study of your product and production setup and enumerate the possibilities and advantages of applying it on the broadest possible scale. This service will not obligate you in any way.

FREE . . . Complete Cold Treating Information

This new 40-page booklet contains all of the facts necessary for a complete understanding of industrial Cold Treating. It explains in detail what occurs within a metal structure when cold treated; illustrates its many uses and resultant savings in time and money; lists up-to-date Cold Treating procedures, gives the names of manufacturers using Deepfreeze equipment; and numerous additional data which you need in applying it to your production. Write today for your copy of Bulletin No. I-4.

Deepfreeze

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When workers sweat, their bodies lose essential salt. This loss causes Heat-Fag, inalertness, fatigue, heat prostrations. Accidents increase. Production goes down.

Morton's Salt Tablets at every drinking fountain provide an easy, simple, effective way to restore this vital salt lost through sweat. The cost is less than a cent a man per week.

In salt tablets, as with other grades and types of salt, Morton is the recognized leader. Order Morton's Salt Tablets and Dispensers from your distributor or directly from this advertisement. Write for free folder. Morton Salt Company, 310 S. Michigan Ave., Chicago 4, Illinois.

MORTON'S DISPENSERS

They deliver salt tablets, one at a time, quickly, cleanly — no waste. Sanitary, easily filled, durable.

800 Tablet size - - $3.25

MORTON'S SALT TABLETS

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Salt Dextrose Tablets, case of 9,000 - - - $3.15

MORTON'S SALT TABLETS

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PALMGREN Heavy Duty Angle Vises are built sturdy and rugged for tough, heavy jobs. They are accurately graduated in degrees, can be quickly adjusted to any angle, stay locked under severe service and save valuable hours otherwise wasted in tedious make-ready, wedging or making temporary jigs and fixtures.

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THREE UNIT SAFETY SMOOTH DESIGN

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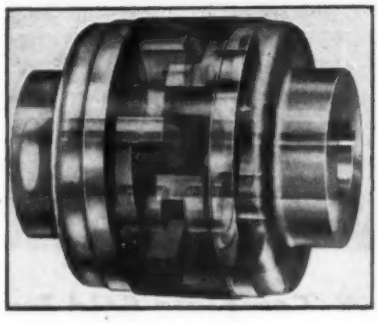

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DEPARTMENT A

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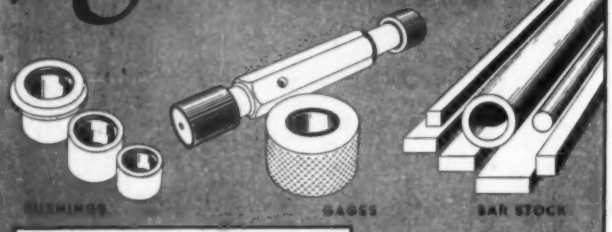
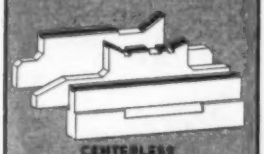
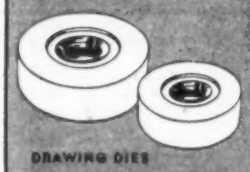


TALIDE METAL . . . is a superior grade of Tungsten Carbide—developed by us during the past fourteen years and manufactured today by our exclusive Hot Press Method. It has exceptional density, strength and hardness and is ideal for application at wear points on tools, machinery and equipment. Our special process makes it possible to produce Talide Metal wear strips in any length, die nibs and bushings with hole sizes up to 24", and tool tips with extra hardness and toughness.

War plants all over the country are using super-hard Talide Metal to increase the output of all types of ordnance material processed on lathes, grinders, draw benches, presses and other metal-working equipment.

When peace comes, the extra advantages that Talide Metal offers of LONGER LIFE, BETTER FINISH, CLOSER TOLERANCE and MORE CONTINUOUS MACHINE OPERATION will make it possible to produce greater quantities of lower cost peace-time goods. Our experienced organization will gladly recommend where Talide Metal can profitably increase your production. Your inquiry will receive our prompt attention.





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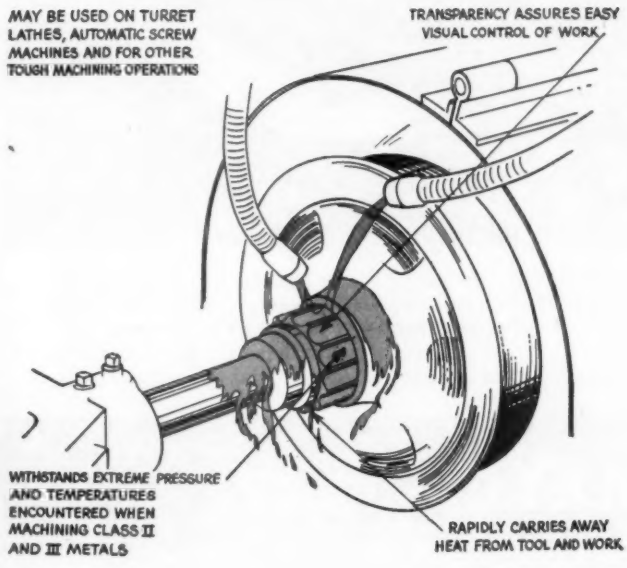
STANDARD ENGINEERS NOTEBOOK

VOL. 2-W No. 7

Potent cutting oil produces good surface finish


MAY BE USED ON TURRET LATHES, AUTOMATIC SCREW MACHINES AND FOR OTHER TOUGH MACHINING OPERATIONS
TRANSPARENCY ASSURES EASY VISUAL CONTROL OF WORK
WITHSTANDS EXTREME PRESSURE AND TEMPERATURES ENCOUNTERED WHEN MACHINING CLASS II AND III METALS
RAPIDLY CARRIES AWAY HEAT FROM TOOL AND WORK

When machining Class II or Class III metals many operators have found the high lubricating value and extreme pressure quality of Calol Cutting Oil—20TA ideal for producing the desired finish. Because it is transparent, Calol Cutting Oil—20TA affords a machine operator complete visual control of work.

This special cutting oil is made from highly refined oils and compounds which give it unusual potency and transparency. It is an excellent coolant —carries heat away rapidly from tools and gives them longer service life.

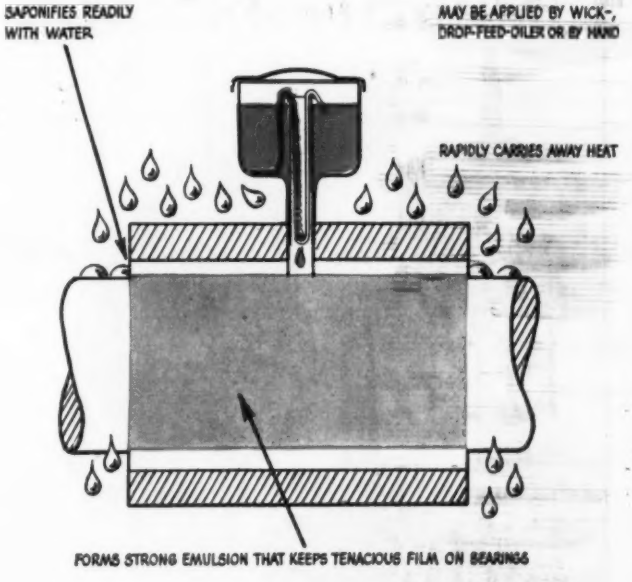
Recommended for tough work, Calol Cutting Oil—20TA is used on turret lathes, automatic screw machines, etc. It can be used when machining brass or bronze where slight staining is not objectionable and work is cleaned or pickled after machining.

Saponifying oil protects wet bearings

Bearings that operate in wet conditions are assured of constant lubrication by use of Calol Marine Oil—31X. It saponifies readily with water and forms a rich, creamy emulsion. Under the most severe conditions this emulsion provides a tenacious, oily film on bearings that prevents metal-to-metal contact, lubricates and cools.

Calol Marine Oil—31X is made from selected oils which are specially refined and then blended with certain compounds. These compounds give it saponifying qualities and high lubricating values. It is a wide-range, heavy-bodied oil which retains its body well in high temperatures and flows readily in lower temperatures.

Especially recommended for external lubrication, Calol Marine Oil—31X may be applied by wick- or drop-oilers or by free oiling. It is used on shafting, reciprocating pumps, ice machines, air compressors and engines where a saponifying oil is desired.

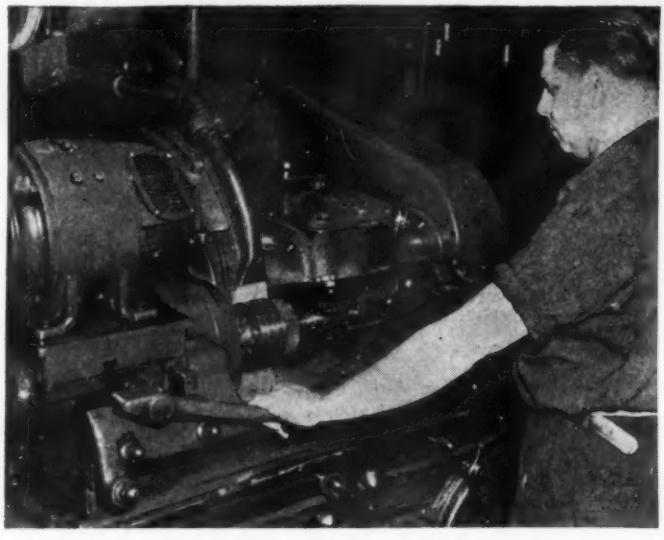

SAPONIFIES READILY WITH WATER
MAY BE APPLIED BY WICK-, DROP-FEED-OILER OR BY HAND
RAPIDLY CARRIES AWAY HEAT
FORMS STRONG EMULSION THAT KEEPS TENACIOUS FILM ON BEARINGS

There is a Calol Product to meet every industrial lubrication problem. For information, write Standard of California, 225 Bush Street, San Francisco 20, California.

The properties of Economy Grinding Lubricants which produce these excellent results on finish-groove grinding roller bearing outer races are equally valuable to any company with a grinding job to do. Even the toughest work can be handled at economy-promoting speeds, and with unusually long wheel life.

Ground parts which must carry heavy loads are produced better with Economy Grinding Lubricant. Because Economy Grinding Lubricant provides easier stock removal there is less disturbance of metal structure. This means higher load carrying capacity.

Follow the example of leading metal working manufacturers and submit your grinding problems to The White & Bagley Company technical representatives.



NORTON 10" x 18" CYLINDRICAL GRINDING MACHINE finish-groove grinding cylindrical roller bearing outer races—4" O.D., rate 27 per hour
Courtesy SKF Industries, Inc.
Catalog G-18 gives all the facts. It's yours for the asking.

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ERRINGTON MECHANICAL LABORATORY
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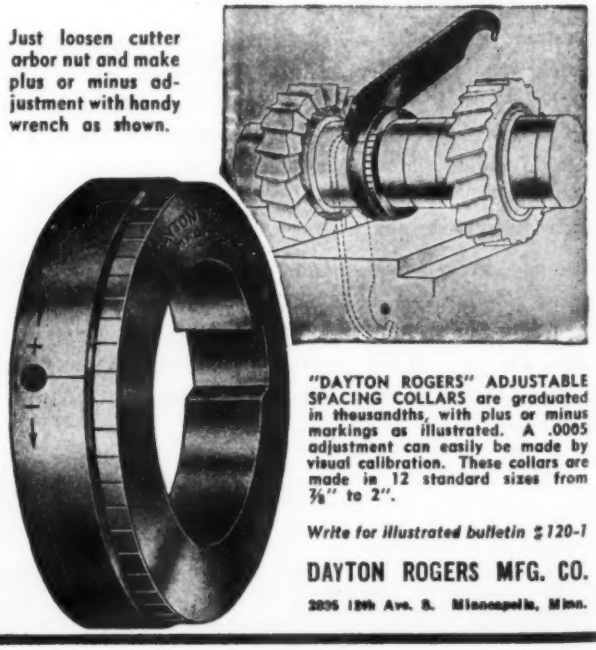
All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles
ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

SAVE TIME ON YOUR
GANG MILLING SET-UPS

You are assured FAST—ACCURATE spacing on all side milling cutters and gang milling set-ups with
DAYTON ROGERS ADJUSTABLE SPACING COLLARS

Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown.



"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅜" to 2".

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Designed by Boyar-Schultz, with full understanding of the many problems confronting the screw machine operator. Made from the finest quality materials with "built-in" sturdiness for long, accurate and dependable service. For automatic or hand machines.

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A large Screw Machine Tool for large work. Designed for quick, accurate set-up, for precision turning. Individually adjustable roller blocks; maximum turning capacity 1¼. Available with shank diameter 1¼" or 1½".

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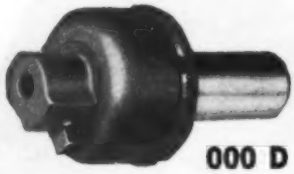
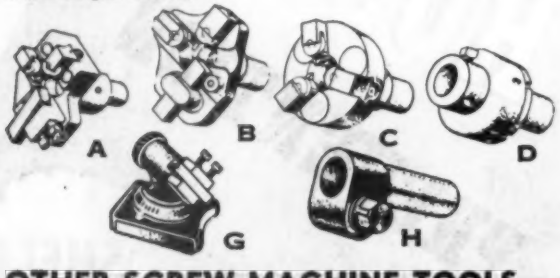


000 D

This new Floating Tool Holder is made from the same fine materials, and with the same precision workmanship as other Boyar-Schultz Screw Machine Tools. New feather-weight tool head assures quick alignment for precision reaming, counter-boring and drilling operations in production.



OTHER SCREW MACHINE TOOLS

Model A, in sizes 00, 0 and 2; MODEL B, in sizes 00, 0 and 2; MODEL C, Burnishing Tool in sizes 00, 0 and 2; MODEL D, Floating Tool Holder in seven sizes, 000 to 6; MODEL G, Universal Tool Bit Grinding Fixture; MODEL H, Precision Adapter, in four sizes.

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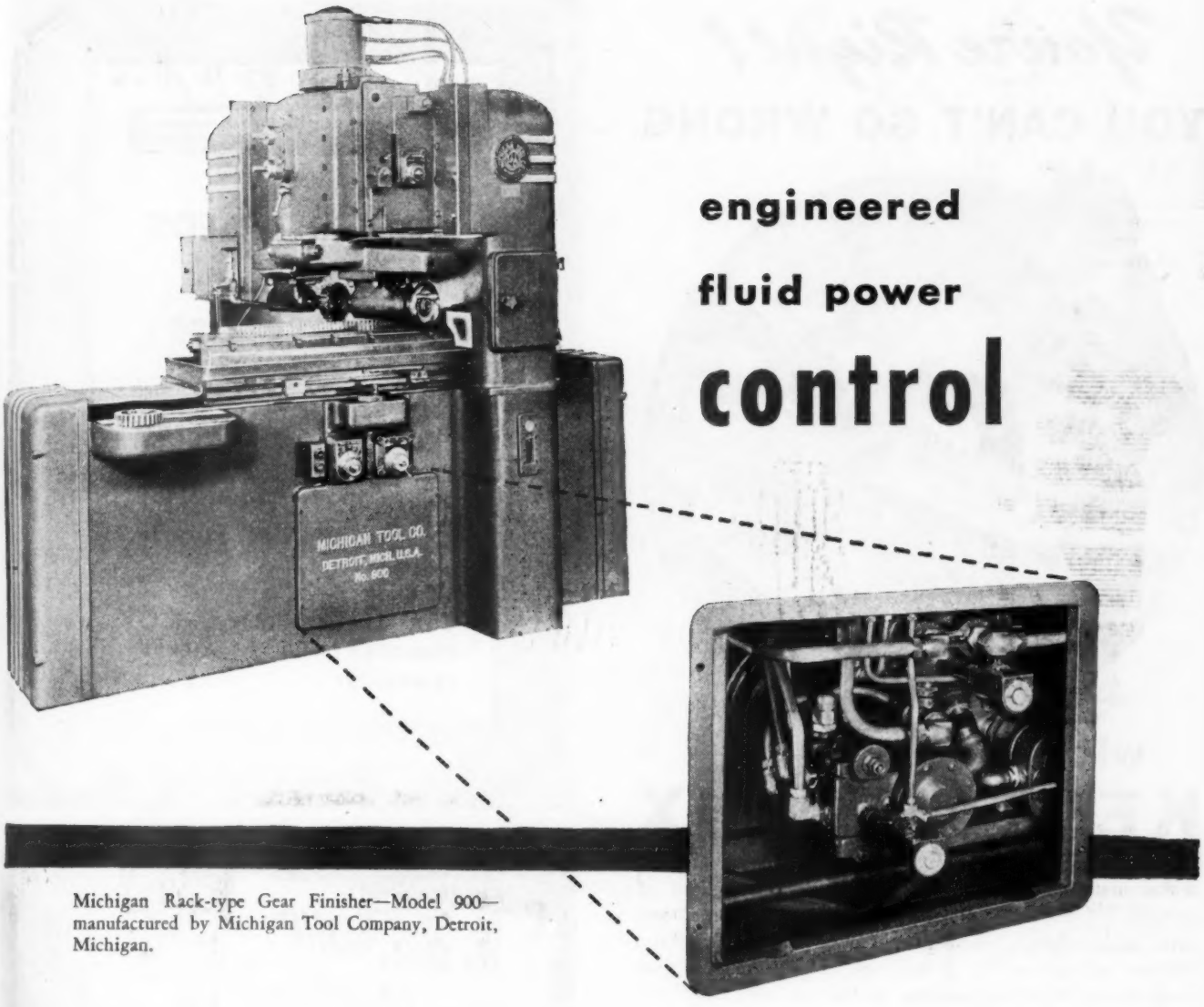

engineered fluid power control

Michigan Rack-type Gear Finisher—Model 900—manufactured by Michigan Tool Company, Detroit, Michigan.

The hydraulic controls which make this machine—and millions of others—do their work with such reliable precision call for tubing systems based on the principles of Fluid Power Engineering.

When properly engineered and built, these systems have certain "must" features—

1. They streamline the flow of fluids. This permits adequate response to control with minimum system capacity.
2. They make minimum demands on the power source —an economy feature.
3. They fit into the available space, even when space is limited and cramped.
4. They are planned for easy accessibility to all parts— for service and maintenance.
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● *Because Kester makes the* RIGHT *Flux for every kind of solder-bond.* Delicate, dip-soldered electrical connections, sweating operations, various types of seams, all demand a different and *correct* flux if they are to be permanent, and resist shock, vibration, bending, contraction, and expansion without failure!

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between grinds on lathes and grinders equipped with RED-E High Speed Steel centers because they have high speed steel ends. All tapers and sizes. *Write for Bulletin.*

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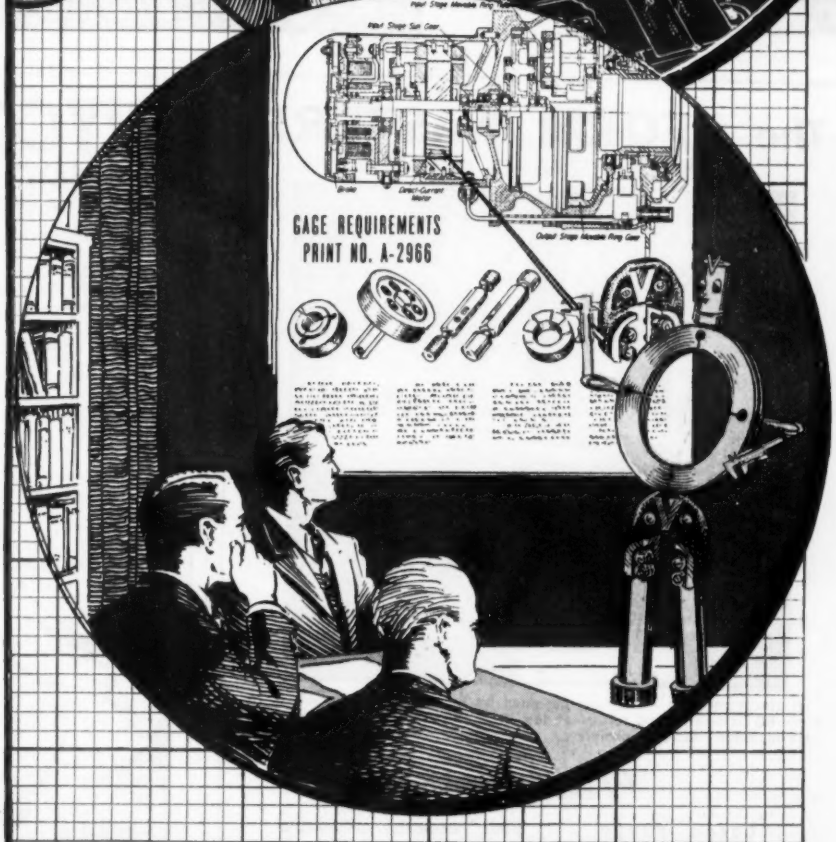

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ARMY E NAVY

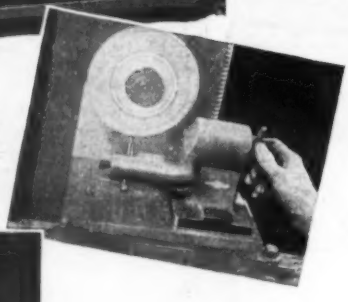
To Dress Grinding Wheels To Gage Block Accuracy

The American Radius Dresser is a sturdy, compact precision-built grinding fixture. Simplifies the process of dressing grinding wheels to gage block accuracy. Dresses grinding wheels up to 7¾" diameter with concave or convex radii up to 1 inch.

Base of radius dresser is machined parallel to center line of swivel arm. Sets against straight edge of magnetic chuck. Wheel is dressed in same position as work is ground. Z-shaped set-up block is clamped to swivel arm and removed after diamond has been set to correct radius with gage block.

Swivel arm rotates on hardened and ground steel shaft; dust-proof bearings; constant lubrication.

Reasonably priced. Delivery from stock.



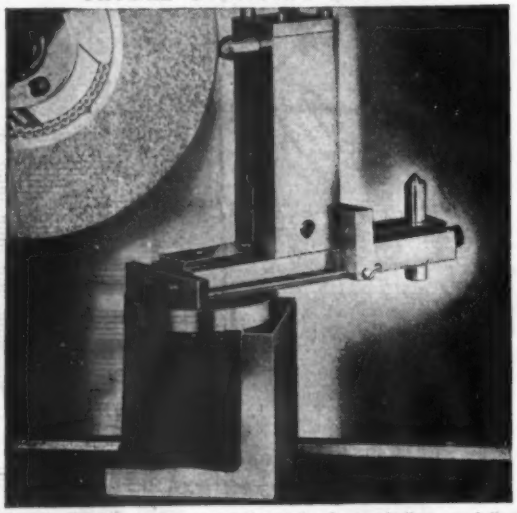
Handwheel in safe position. Wheel guard does not have to be removed.

Send for Bulletin 43-MT for complete details on American Amplifying Gages, Thread Checkers, Hole Checkers, Bench Centers and Lapping Plates.

Diamond is set to gage block accuracy.

THE AMERICAN GAUGE CO.
125 Bayard St. DAYTON 1, OHIO

The "FORM MASTER"
ANGLE & RADIUS DRESSER



A sturdy, quality instrument designed by form-grinding specialists to dress BOTH angles and radius at low cost. Two 1/3 ct. diamonds and case included—$150.00 complete.

Features

Large range	.0001" accuracy obtainable
Chatterless	Simple to operate
Dustproof	Reasonably priced

Call your supplier or write

J. & S. TOOL CO. 477 Main Street E. ORANGE 1, N. J.

WYCO Hy Speed Saw
SAWS and FILES
METALS • WOODS • PLASTICS

Fits any ¼" Electric Drill, Air Drill or Flexible Shaft.

Chucks in Drill Chuck or Collet
Uses Ordinary Hack Saw Blades and Standard ¼" Shank Machine Files
Easily Used in Difficult Places

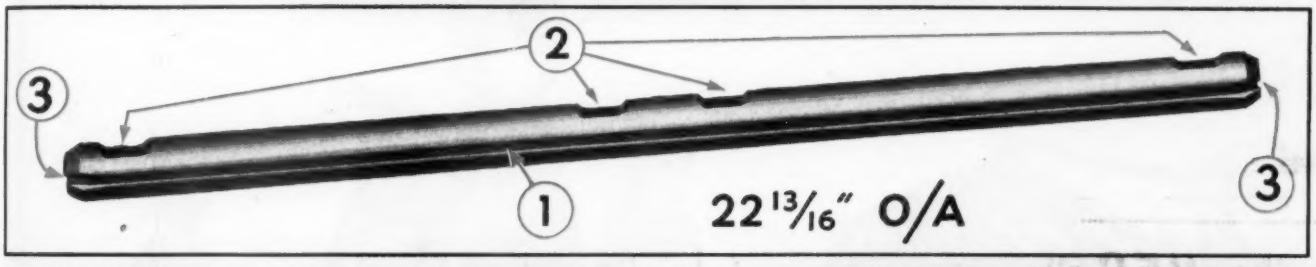
A Speedy, Accurate, Powerful Saw that is an essential tool for every metal or wood worker, machinist and mechanic.

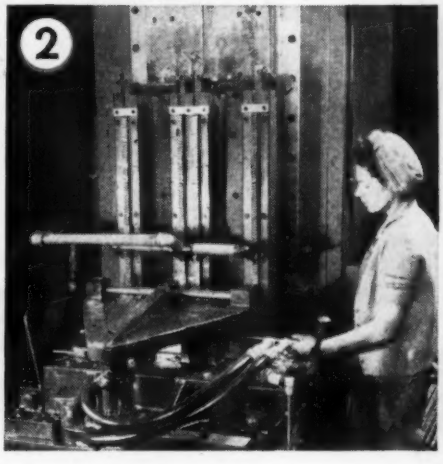
All rotating parts are Ball Bearing and run in oil—no gears—no cams—always smooth running. Saw chuck holds firmly and aligns saw perfectly. A WYCO Guaranteed Tool—Send for Catalog on Complete Line of WYCO Profit Producing Tools and WYCO Flexible Shaft Equipment.

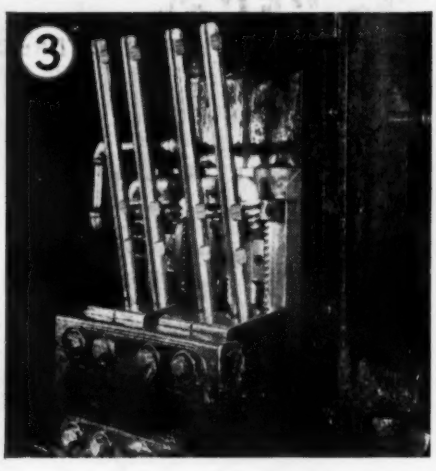
$35.00
Complete, with extra saw blade and ¼" round machine file
Distributed Only Thru Jobbers

WYZENBEEK & STAFF, Inc.
818-844 W. HUBBARD ST. CHICAGO, ILLINOIS

How 3 broaching operations on 3 machines produced 4000 tank track pins per day!







A well known Michigan manufacturer, short of broaching machines and short of help, but confronted with a difficult and urgent tank pin and bushing assignment, took its problem to U. S. Broach. A quota of 4000 pins per day had to be met. Milling would have been much too slow. Broaching was the answer—and *all three operations were broached* and the *quota exceeded* with inexperienced help.

OPERATION No. 1 broached 2 angular slots the full length of this 22 13/16" pin. This was accomplished by cutting two slots in two pins at one stroke of the ram, equal to two finished pins per stroke.

OPERATION No. 2 required one fixture to do one pin at a time. Pins were loaded from one side and located from the inverted slots in order to insure the proper angular relation between slots and flats. Pins were firmly held with hydraulic clamps.

OPERATION No. 3 broached a leading chamfer in each end of the longitudinal slots. Four pins were located in the fixture at one time, as shown above, rotated 180 deg. to complete chamfer on one end, then turned end for end to complete opposite chamfer.

U.S. BROACH Company

USB

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BROACHING TOOL

TELEPHONE TWINBROOK 1-2211

Individually Tested for Adhesion to Spindle

Bay State mounted wheels and points can't be made unless the bond between the abrasive and mandrel is absolutely secure. For these mounted wheels and points are turned down from large blanks and sized and shaped *on their own mandrels.* Thus a positive test for the bond is automatically provided.

Bay State's method of making mounted wheels and points also offers you other exceptional advantages:

1. **No breaking-in period is necessary** — because they are dressed as they are shaped.
2. **They run absolutely true** — because each is concentric to its mandrel.
3. **They are free from hard and soft spots** — because they are manufactured in blanks.
4. **They can be used right down to the mandrel** — abrasive and mandrel are "wedded for life".

Mounted wheels and points have important jobs to do — so proper importance should be given to their selection. If you specify Bay State, you can be sure they'll make the grade.

Similarly, into other items in the broad range of Bay State abrasive products, Bay State builds *extras* that assure consistent performance. Check them. Test them. Get complete facts, including the handy, pocket-size catalog on mounted wheels and points.

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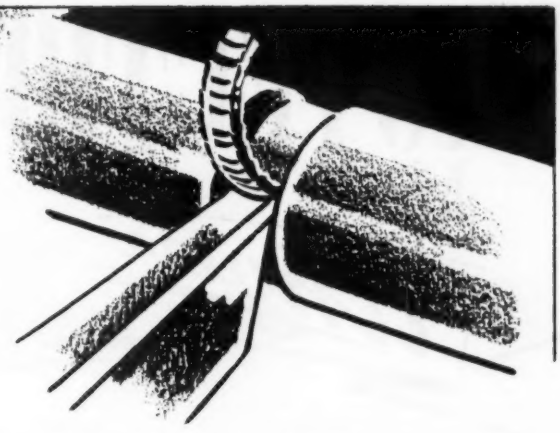
1 Union Street, Westboro, Mass.

ABRASIVE PRODUCTS

Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS

FOR THOSE
TOUGH
CUTTING-OFF JOBS



USE EMPIRE TOOL COMPANY'S LUER'S PATENTED

CUTTING-OFF BLADES

Made of Cobalt

THEY POSSESS all the distinctive features of Empire's standard high speed steel cutting-off blades—but being made of *cobalt,* they have that extra stamina that enables them to take extra hard punishment. Their ability to withstand high frictional heat gives them exceptionally great wear resistance. They are the "toughies"—used where speeds and feeds are beyond the ability of regular blades to "take it"—where the abnormal heat created breaks down the cutting edge.

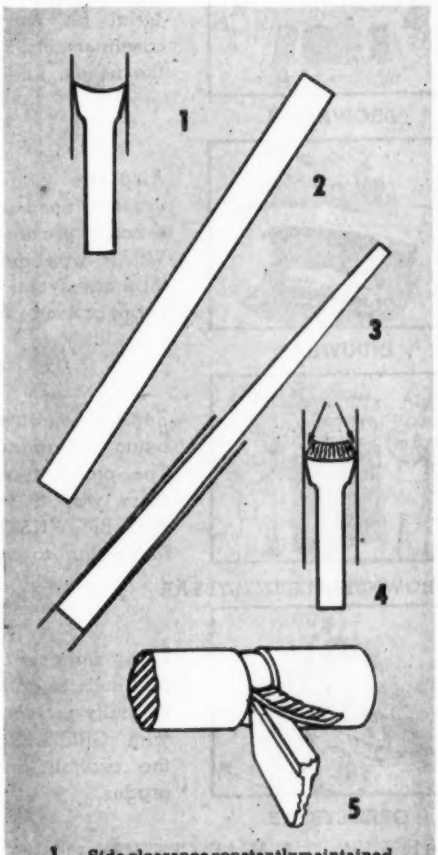
Like their standard counterparts these *COBALT BLADES* are built in "T" shape with hollow-ground top that provides ample clearances—at all essential places—eliminating excessive friction and giving you increased production at lowered costs.

Blades are held in holders especially designed for any standard hand or automatic screw machines, or other applications.

All items are shipped promptly from stock. Catalogs sent on request.

Our engineers (located in principal cities) will gladly call at your plant to assist you in simplifying your cutting-off operations.

EMPIRE TOOL COMPANY MANUFACTURES LUERS PATENTED CUTTING-OFF BLADES AND HOLDERS UNDER LICENSE ISSUED BY JOHN MILTON LUERS PATENTS INC



1 Side clearance constantly maintained.

2 "P" series—parallel on longitudinal cutting width—for uniform width cuts or shallow grooves.

3 "T" series—tapered on longitudinal cutting width—clearances remain constant because resharpening is done only on face.

4 Coolant can reach cutting edges of blade.

5 Hollow ground top collapses chip and draws it away from sidewalls.

EMPIRE TOOL COMPANY

Buy More Bonds

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INDUWRAP

Airplane engines and parts urgently need a greaseproof protector to prevent corrosion. INDUWRAP was developed to more than satisfy all Grade A, Type I specifications.

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BROWNSKIN GRIZZLYBEAR

Engines enroute overseas were being damaged by the elements. The problem of how to protect them was a very serious one. A-19 BROWNSKIN GRIZZLYBEAR is helping to solve it.

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GRIZZLYBEAR

Many shippers of airplane motors and coils of critical wire are successfully protecting their products with GRIZZLYBEAR, using both the asphalt and A-19 resinous grades.

1895-1945 . . . A HALF CENTURY OF PROTECTION TO PRODUCTS OF OUR NATION AND ITS INDUSTRIES . . IN PEACE AND WAR

In asking for samples and literature please mention by name this magazine.

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CORROSION PREVENTIVE AND WATERPROOF PAPERS

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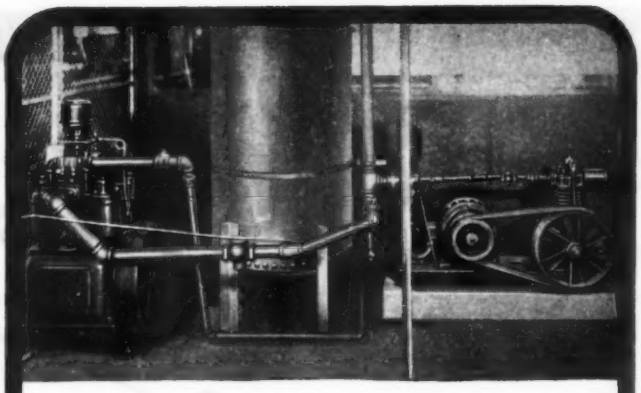

At Parker Pen Factory

CURTIS COMPRESSORS

Deliver 60 cfm of Air at Low Cost of only 12c per hour

USING two Curtis Air Compressors, the Parker Pen Company factory at Janesville, Wisconsin, uses air for a variety of jobs in their factory.

Air is being used to replace noisy blowers on gas furnaces, to operate air valves on various special machines — such as operating a high speed internal grinder and operating ejectors to clear work from 20 punch presses, blowing dust out of dies, and for cleaning up around automatic screw machines.

Compressed air also controls the "dry pipe" sprinkler system, eliminating the possibility of water lines freezing.

D. A. McLaughlin, Supt., states that "the power cost on our larger Curtis Compressor does not average over 36c a day for three hours' operation, *making our cost for air remarkably low.* The operation of these Compressors, with no repairs and only ordinary oiling and cleaning — has been so satisfactory that we are highly pleased with Curtis Compressed Air Service."

Here is just another example of the dependable, efficient service you can expect from Curtis Air Compressors . . . the result of such experienced design features as:

- Tapered Roller Bearings
- Centro-Ring Lubrication
- Carbon-free Disc Valves
- Automatic Pressure Unloader
- Precision Construction Throughout

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CONSERVE METALS — BUY WAR BONDS

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● Please send me booklet, "How Air Is Being Used in Your Industry."

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INTRICATELY FORMED METAL STAMPINGS

a specialty with the

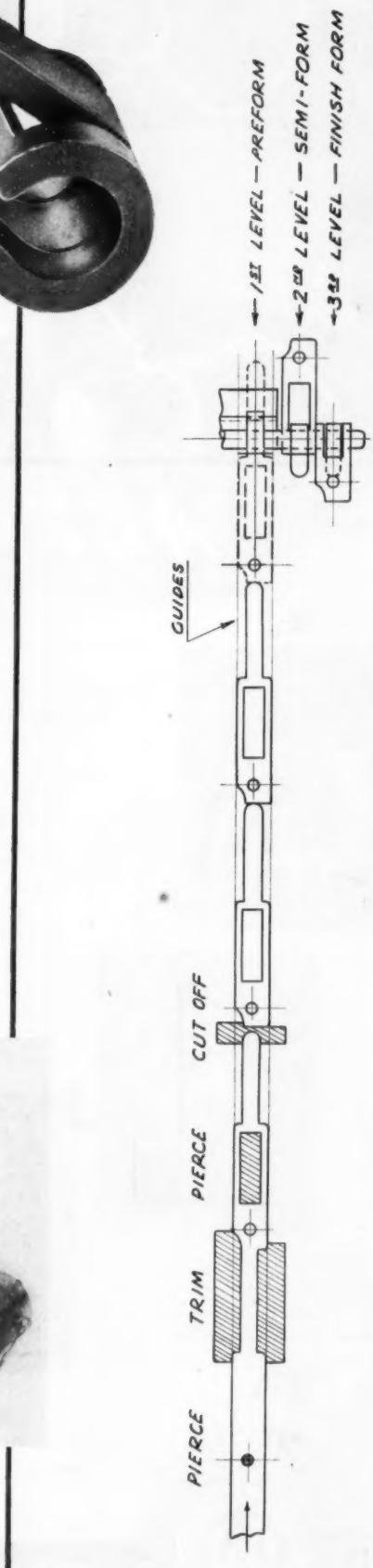
U. S. MULTI-SLIDES

THE upper photograph shows an intricately formed part made from .095" copper which is produced complete from coil stock at a speed of 90 per minute in a U. S. Multi-Slide Machine. The particular model used for the work is known as the No. 33 U. S. Multi-Slide and a reduced photograph of this machine is shown below.

An inspection of the stock and tool layout shows that the blank is pierced, trimmed, and cut off in the die head and that the forming is carried out on three levels. After preliminary forming the partially formed blank is transferred by the stripper mechanism to the second level for the intermediate forming operation and then to the third level for finish forming. The motions of the die head, forming slides, and stripper are all cam controlled and split type cams are used throughout for easy removal and set-up.

This is just one of the many different types of complicated formed stampings which can be handled automatically and economically on the U. S. Multi-Slide Machines. Many parts, of course, can be completely formed on one level, and the three level forming is brought out simply to emphasize the versatility of the machine.

Bulletin #15A contains complete specifications—ask for your copy



U. S. TOOL COMPANY, INC.

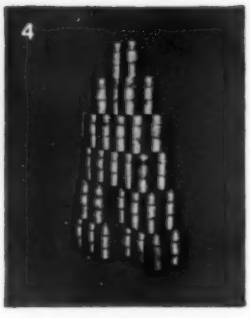
AMPERE (EAST ORANGE)
NEW JERSEY

Builders of U. S. Multi Slides—U. S. Multi Millers—U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

1

2

3


4

1 Crane deck center
2 Hydraulic press fabricated at United.
3 Large Settling tanks for paper mill.
4 Field rings--a production item at United.

Here the action produces a blower impeller—in other parts of the plant machine tool bases, field rings, Diesel or crane parts, a great variety of work is in process. The fabrication of large and heavy weldments, complicated assemblies and parts that have to be held to close tolerances is daily routine.

Perhaps your product can and should be welded—to strengthen it—to lighten it—to improve its appearance—perhaps to reduce its cost. If so United Welding has the capacity, equipment and know how to weld it to your satisfaction.

Engineering service on call. Estimates on submitted drawings.

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WELDING FABRICATORS OF MODERN DESIGNS

IMMEDIATE DELIVERY

No. 1 to 60 New High Speed Long Length

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If you buy 60 drills or more — 20% discount

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MACKLIN Centerless Grinding Wheels are becoming more and more important in their wide variety of uses and applications. Costs are constantly being cut and more exacting limits are being obtained in this field of grinding. Macklin Grinding Wheels, used on centerless work, have consistently produced efficient results. They grind fast and cool and give an excellent finish while grinding to exacting limits.

MACKLIN high quality wheels, in all sizes and shapes for EVERY grinding purpose will

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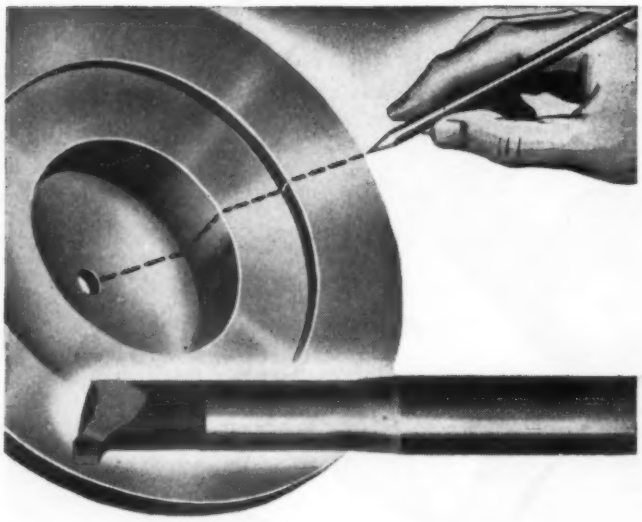


ONE TOOL did all this!

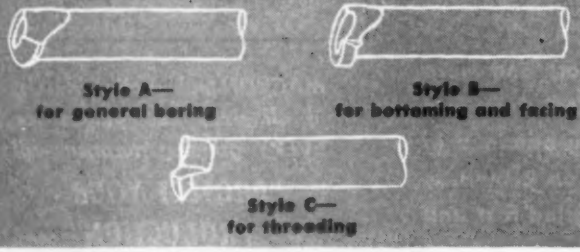
. . . Bored and bottomed the large blind hole — then faced the stepped surfaces.

ALL WITH ONE

BOKUM BOTTOMING AND FACING TOOL (STYLE B)

Helical back off insures constant clearance and extremely long life of tool, since sharpening is done by grinding face only. Why use two tools when the job can be done with one?

BOKUM SINGLE POINT CUTTING TOOLS



Ask for Catalog K-1139 for Super High Speed Tools and for K-398 for Carbide Tipped

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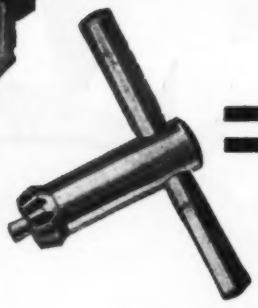
Almond Drill Chuck



The Original Manufacturers of Drill Chucks

As Pioneers in their field, ALMOND THREE-JAW DRILL CHUCKS have played an important part in machine tool development. They were the first to be placed on the market more than seventy years ago.

Types and sizes are available to fit all machine tools and portable drills.

Write for complete information.

T. R. ALMOND MFG. CO.
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Diamond Tool COST CONTROL

The Koebel Library of Conservation Information is available to help reduce the ultimate cost of your diamonds. Practical employee training literature on how to use—how not to abuse—diamond tools. Write today for details.

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KOEBEL DIAMOND TOOL CO. - 9446 Grinnell Ave., Detroit

Grobet ROTARY FILES

HAND CUT • MILLED CUT
GROUND FROM THE SOLID

There is a Grobet Rotary File, Cutter, Diesinkers Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. Send for Catalog DR. illustrating the complete line in full size, speed charts, etc.

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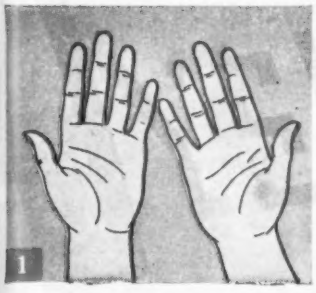
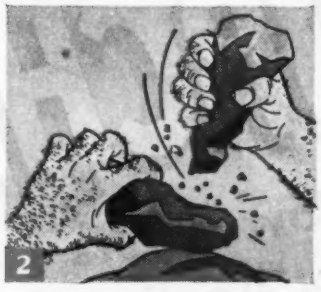
IMPORTERS OF GROBET SWISS FILES · MFRS. OF GROBET ROTARY FILES
Plants: New York • Chicago • Los Angeles

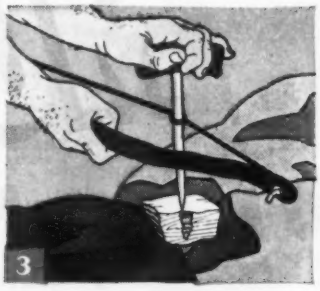
It started with the other hand



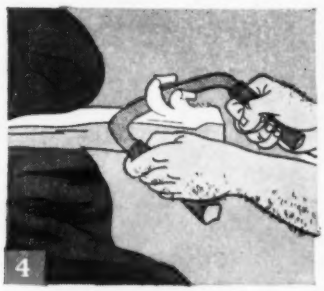
Right or left-handed, your *other* hand is a type of jig.



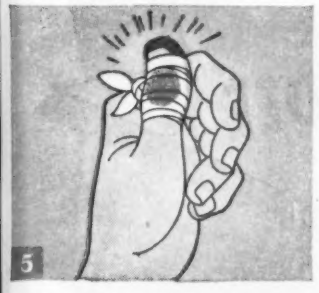
A jig is something to hold work while you're working on it.



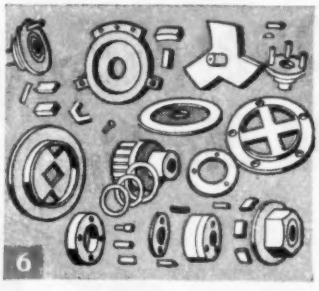
Notches in stones or logs left both hands free.



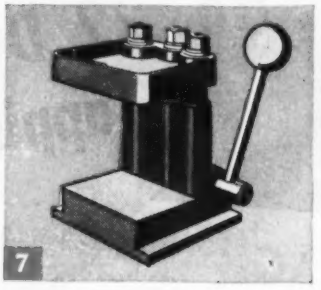
Two heavy stones once served as a sort of vise or jig.



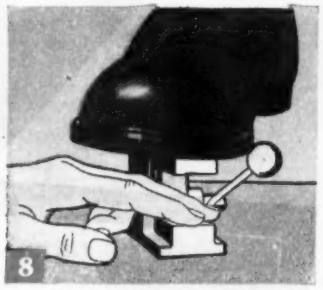
Modern adjustable jigs have two faults. Some slip, hurt people.



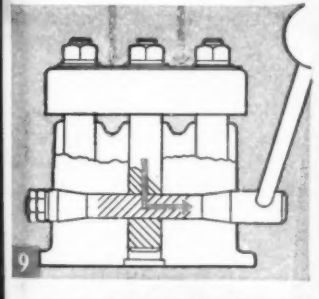
Locking mechanisms of others wear out fast or fail.



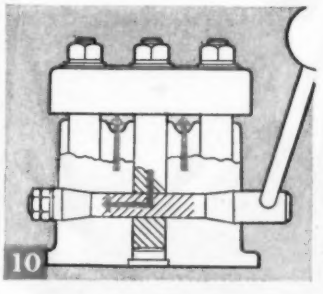
These problems were solved by Woodworth's CONE-LOK JIG.



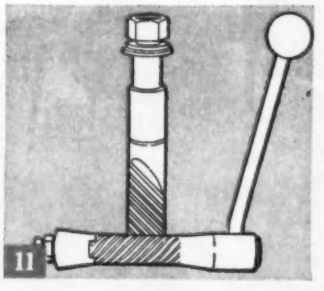
This amazing jig locks instantly. Can't slip. Protects workers.



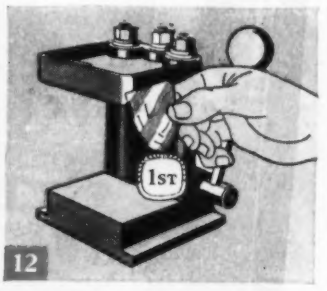
Force on top travels thru 45° gear to right. Left cone locks.



Force from below is transmitted to left . . . locks cone at right.



CONE-LOK JIG is simple. Three moving parts do the job.



CONE-LOK is praised by production men everywhere.

What Woodworth products mean to industry

THE contribution to mass production efficiency made by the CONE-LOK JIG is typical of all Woodworth products.

There is a reason for this.

Every Woodworth product must conform to the basic policy of this company . . . *to make only products which will benefit industry through increased production and reduced costs.*

This means that the great demand for Woodworth Tools and Gages will be continuing, especially in view of the coming battle for postwar markets.

And it means that Woodworth engineers have been charged with the responsibility of searching constantly for new ways to speed up and lower the cost of production, in connection with Woodworth products of the future.

The constant growth and expansion of the N. A. Woodworth Company is due to strict adherence to these objectives.

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N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD, DETROIT 20, MICHIGAN

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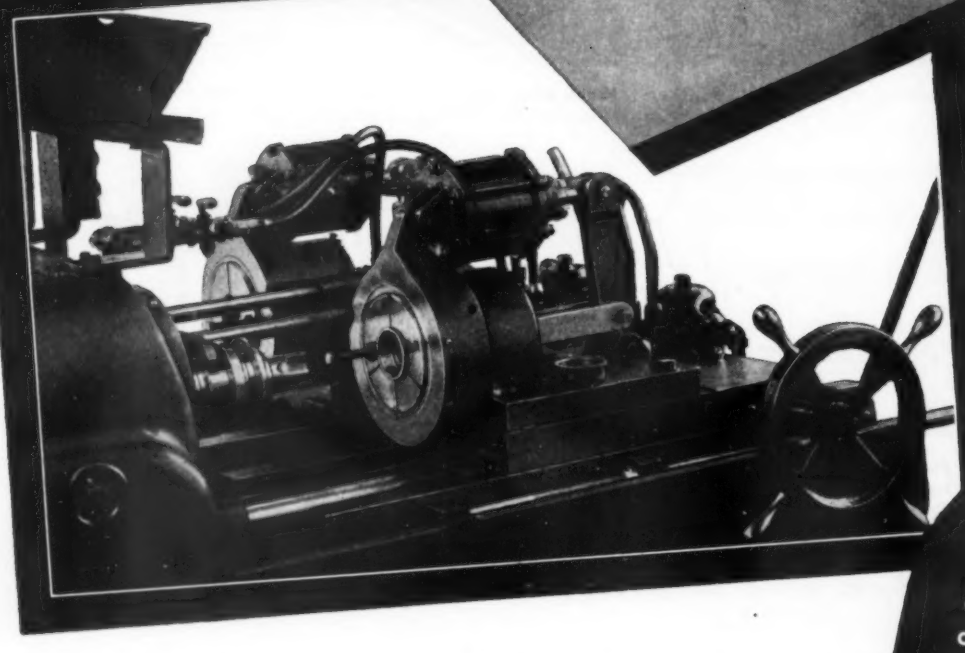
PRECISION MACHINED PARTS

PRECISION TOOLS

KEEPING AHEAD OF THE TIMES

MURCHEY

Now Offers Special Applications for No. 22 DOUBLE SPINDLE Tapping Machine



● Sizes and depths of threads for this particular application are as follows: Size 3″ Straight Pipe Thread — Depth 5/8″ in C. R. Steel W. D. 1010. Two hundred and fifty pieces per hour on two spindles. No. 22 Double Spindle Tapping Machine is capable of various other applications. Write us your requirements.

Write also for information on Collapsible Machine Taps; Self-opening Die Heads; Thread Milling; Shell Tapping and Roller Pipe Cutting-off Machines.

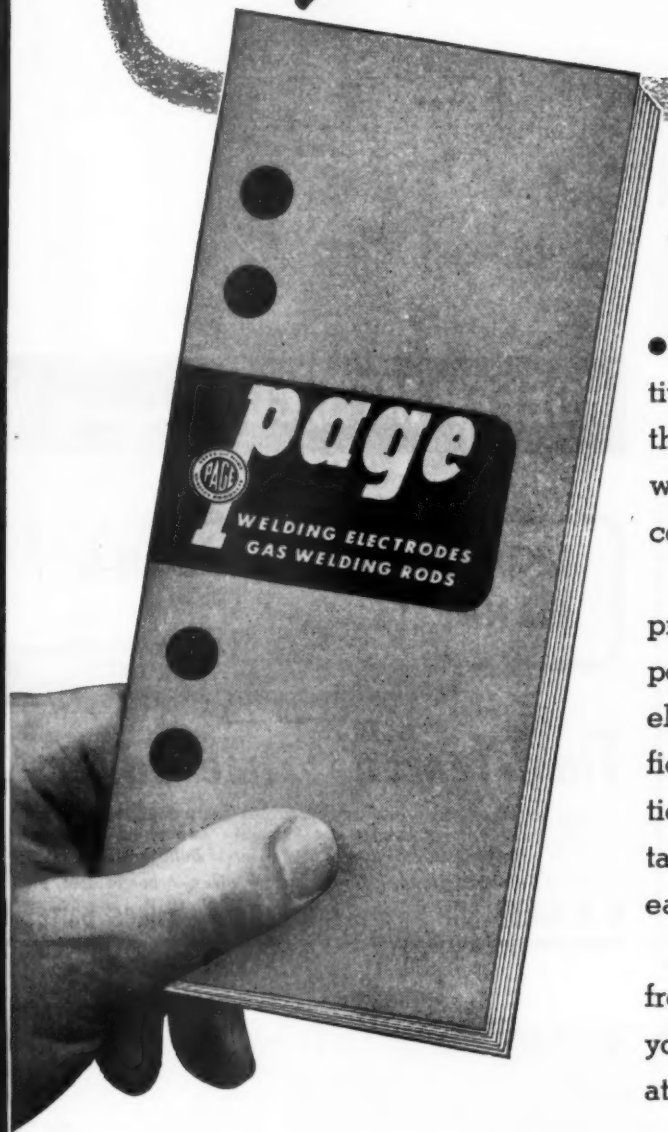
MURCHEY MACHINE & TOOL CO.

Dept. A • Detroit 26, Michigan

MURCHEY

PAGE *Welding* ELECTRODES

IT WILL SOON BE *Dog-Eared* FROM USE



● This new **PAGE** book is so informative, so complete and so easy to use, that we prophesy in many shops it will soon become dog-eared from constant use.

Twenty-eight different classes of production welding are listed. Opposite each is the recommended electrode or gas rod. Complete specifications and welding characteristics of each electrode and rod are tabulated for quick reference and easy reading.

You can get copies of this book from your **PAGE** distributor. Or, if you prefer, write to the **PAGE** factory at Monessen, Pa. Ask for DH-821.

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Monessen, Pa., Atlanta, Chicago, Denver, Los Angeles, New York, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

HOEFER MILLING HEADS

Counterbore

24 . . . 2½" DIA. HOLES IN 7.8 SECONDS . . . . .

COUNTERBORING TRACK LINKS

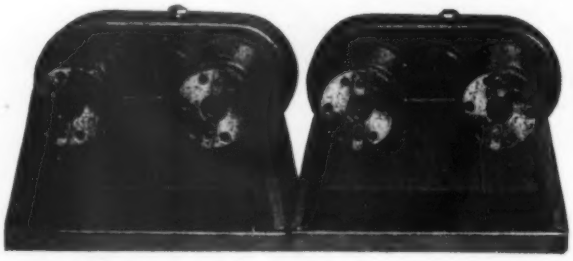
2½ in. diameter by ⅜ in. deep holes. Speed 40 feet per minute—61 r.p.m.

4 tooth cutter cuts .048 in. per revolution.

4.928 feet penetration per minute.

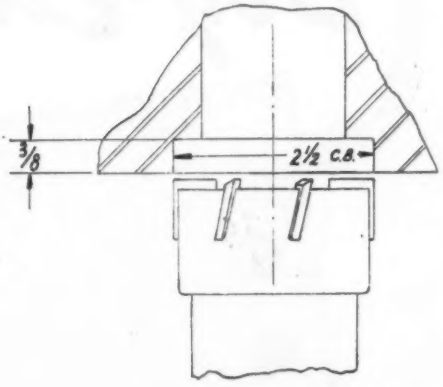
⅜ in. depth—7.8 seconds actual machining time for both counterbores.

● Hoefer Heads not only increase production per hour but decrease cost of drilling or allied operations . . . also they increase production from the same floor space (no new machinery needed) and decrease handling time. Write and tell us of your needs and we will make recommendations.



Two of a group of twelve two-spindle milling heads arranged for mounting of counterboring milling cutters, with standard key drive for counterboring Track Links. The spindle construction is that of standard milling machine type.

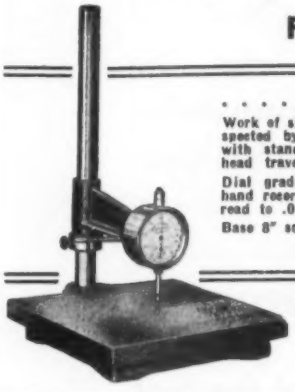
No matter how difficult your problem may seem to you, the chances are that we have furnished Multiple Spindle Heads for similar use. Not only have we built heads for mounting on drill presses but also on rotating spindles and for mounting on the turret of turret lathes motivating them through the machine spindle containing the work.



Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

The RANDALL & STICKNEY Platform Gauge



. . . . *takes work up to 7 inches*

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

Dial graduated 0 to 50 in thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

Investigate Now!

RANDALL & STICKNEY

Waltham 54, Mass.

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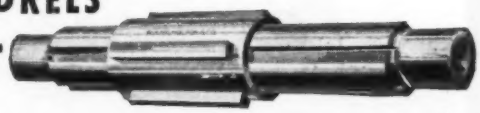
NICHOLSON E-X-P-A-N-D-I-N-G MANDRELS ARE



Time-Tested "Time Savers"

Set of 19 of these economy, precision tools does the work of 193 solid arbors. Hardened tool steel. Two types, all sizes. Sold singly or in sets. Prompt delivery. *Bulletin 1043.*

Other Products: Steam Traps, Control Valves, Arbor Presses, etc.

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Stuart's SOLVOL *(Aquamix)* **LIQUID CUTTING COMPOUND**

D. A. Stuart Oil CO. LIMITED

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FOR ALL CUTTING FLUID PROBLEMS
Stocks in Principal Metal Working Centers

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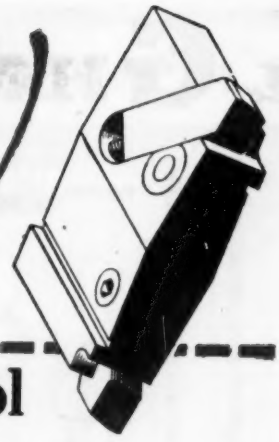


Block Type Boring Tool

This quick detachable cutter block provides self-centering, positive locking, quick inserting of block in boring bar and easy removal, without the aid of locating holes or screws, keys, wedges or taper pins.

The block containing the fully adjustable blades is simplicity itself. Made to engage both sides of the precision ground flats on the bar it quickly and accurately centers itself. When located, the cutting thrust pressure is evenly distributed against the back and bottom of the slot.

This new tool combines quick change, positive drive and accuracy. Greater rigidity is assured because the bar is free from centralizing screw holes.

HOW IT WORKS: To Insert Block slip block through the slot in the bar until the projecting lugs engage the ground flats on the bar. It is then perfectly centered. Snap in spring clips which hold the block in place and effectively seal the unit from dirt, chips, etc.

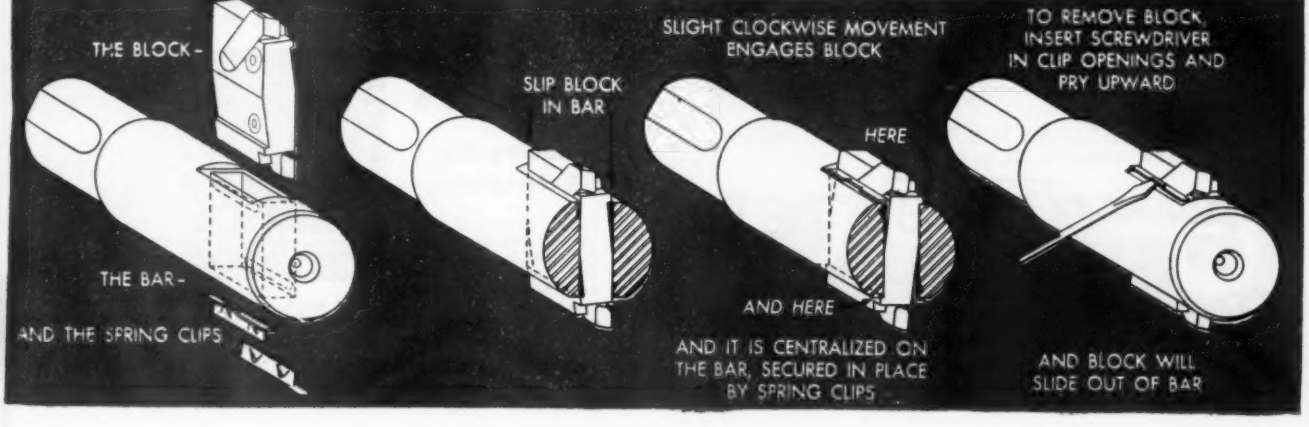
To Remove Block flip out clips, disengage the contact surfaces and withdraw the block.

Blocks can be reversed in bars for inverted operations.

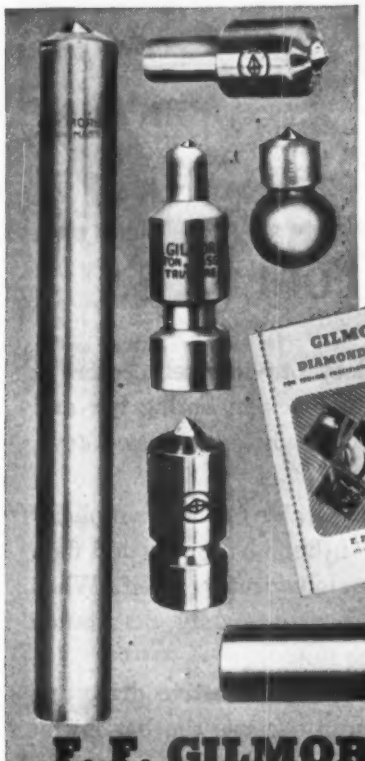
Write for our illustrated folder describing these tools in detail.

GAIRING

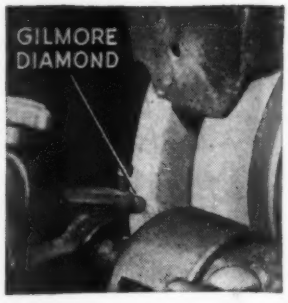
THE GAIRING TOOL COMPANY, DETROIT 32, MICHIGAN


THE BLOCK -
THE BAR -
AND THE SPRING CLIPS
SLIP BLOCK IN BAR
SLIGHT CLOCKWISE MOVEMENT ENGAGES BLOCK
HERE
AND HERE
AND IT IS CENTRALIZED ON THE BAR, SECURED IN PLACE BY SPRING CLIPS
TO REMOVE BLOCK, INSERT SCREWDRIVER IN CLIP OPENINGS AND PRY UPWARD
AND BLOCK WILL SLIDE OUT OF BAR

GILMORE DIAMOND TOOLS



play an important part in truing the precision grinding wheels of leading shops



Gilmore service—in developing and furnishing Diamond Tools to meet the varied and extensive requirements of the metal working industries—is of accepted and recognized value. As specialists of long experience in the manufacture of Diamond Tools, and in diamond cutting, Gilmore has kept pace with grinding technique and its recent highly specialized demands.

The Gilmore line has been developed to meet the present needs of precision grinding and is complete with Diamond Tools to meet every dressing need for every type of wheel.

Investigate the scope of Gilmore service by sending for illustrated literature covering the Diamond Tools available from Gilmore. Outline your wheel dressing problem and ask Gilmore to recommend a solution.

F. F. GILMORE & CO., 285 Columbus Ave., Boston, Mass.

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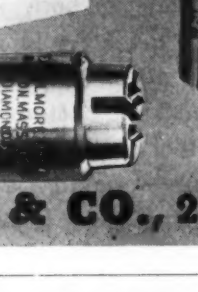
FEATHER TOUCH

LIGHTER-STRONGER MORE ACCURATE

TU-MI-CO TUBULAR construction of special homogeneous grain structure steel is 25 to 50% lighter than solid frame, yet highly shock resistant. Triple plated—copper, nickel and chrome More sensitive feel, easier to use. Low thermal conductivity—combats "walk" in measurement. Tool steel spindle with threads *ground* for accuracy. Adjustment in bushing to maintain alignment Get TU-MI-CO precision. Prompt delivery



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GRINDING WHEEL DRESSER

Desmond Cutter

Desmond Hex Dresser

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

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ARMY NAVY

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates

simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

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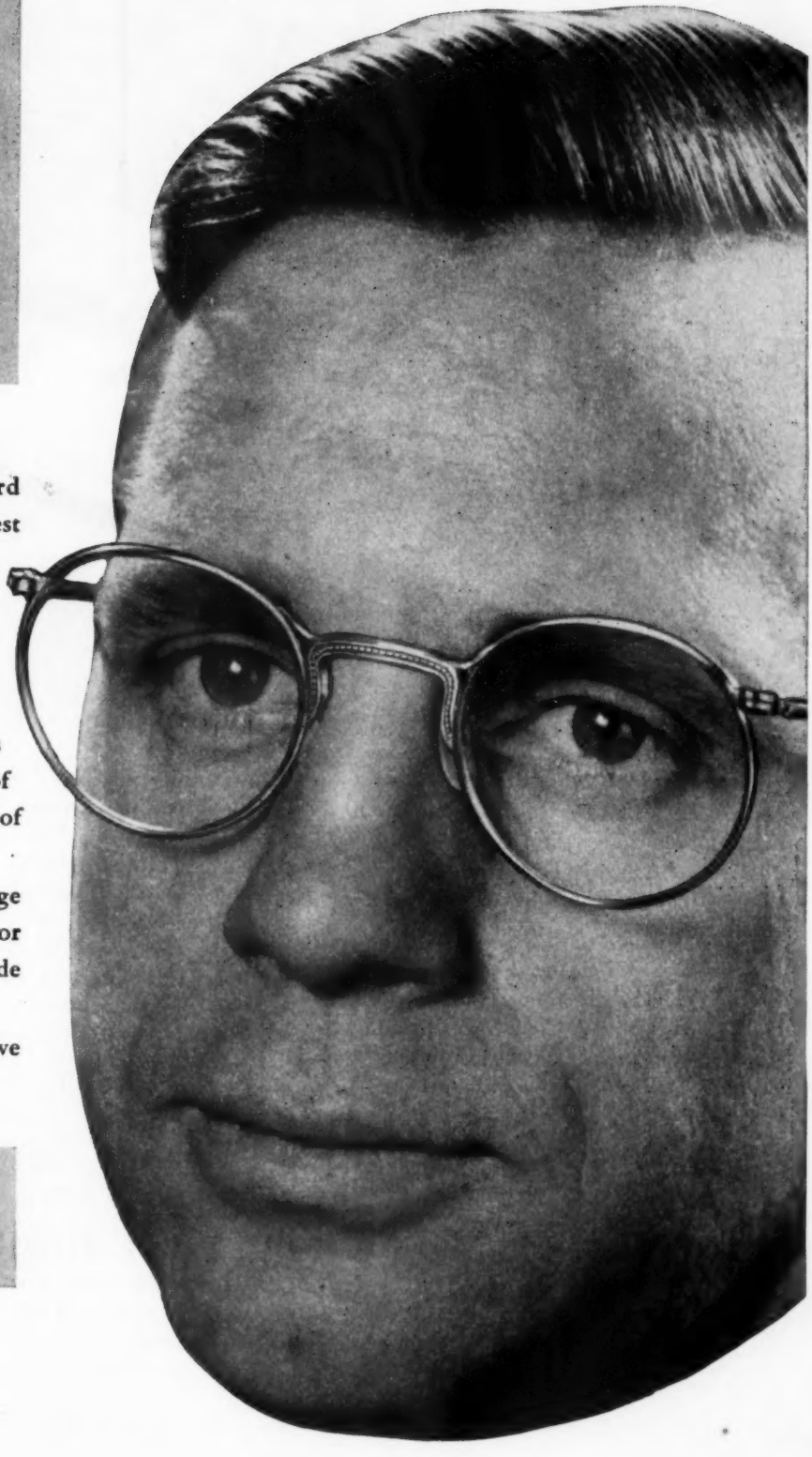
In Canada: 444 Pacific Ave., Toronto, Ont.

AO Ful-Vue Safety Goggles

Eye Protection plus Comfort and Good Looks



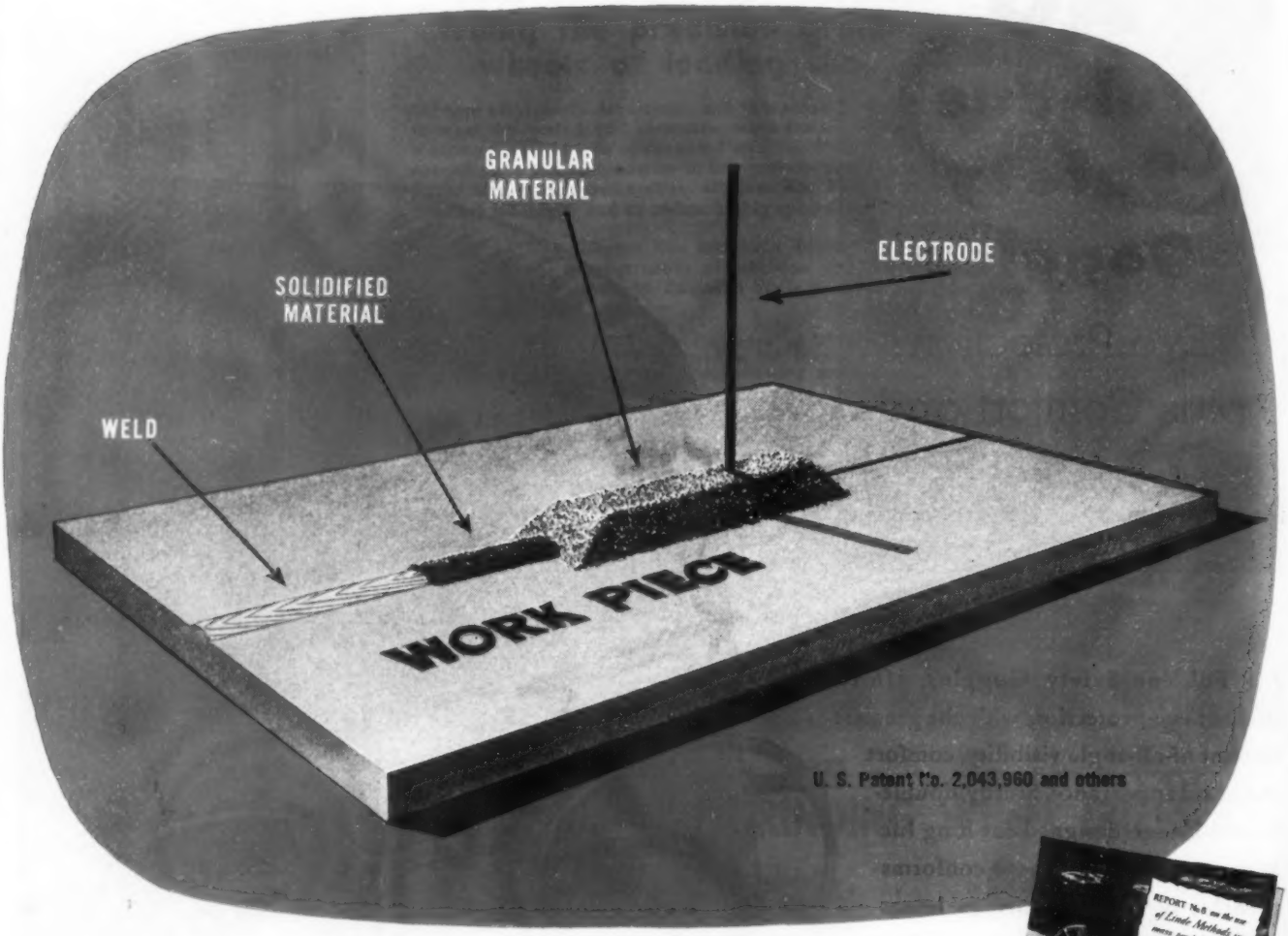
AO Ful-Vue Safety Goggles afford efficient eye-protection with the greatest amount of all-angle visibility, comfort and good appearance. Sturdy, double-braced bridge designed for long life in strenuous service. Shape conforms to orbit of the eye; brings lenses closer for maximum protection; leaves no unprotected areas around bridge of nose. Earpieces have perspiration-proof insulation.

Made in three eye sizes and three bridge sizes, with Super Armorplate Clear or Calobar lenses—with or without side shields.

Your nearest AO Safety Representative can supply you.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS

THIS IS UNIONMELT WELDING



UNIONMELT Welding is easy to recognize. It is electric welding done as diagrammed above—and it makes top quality welds at speeds that are greater than with any other similarly applicable process!

UNIONMELT Welding, a process of welding electrically beneath a mineral melt, has received wide application since U. S. Patent No. 2,043,960 was issued. It is the electric welding process that is rated by many as one of the most important factors in the great wartime fabrication of steel.

Anyone may obtain a license to use UNIONMELT Welding through its developers—The Linde Air Products Company.

Linde can supply a wide variety of equipment and materials to apply UNIONMELT Welding. Linde representatives can help you determine where you can use the UNIONMELT process advantageously and what type of equipment is best suited to your work.

REPORT No. 6 on the use of Linde Methods in mass production...
UNIONMELT Welding—Linde's Automatic Electric Process Joins Metals Up To 20 Times Faster Than Other Methods Of Welding With Rod . . .

For additional information send for the folder "Report No. 6 on the Use of Linde Methods in Mass Production."

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THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York 17, N. Y. UCC **Offices in Other Principal Cities**

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The word "Unionmelt" is a registered trade-mark of The Linde Air Products Company.

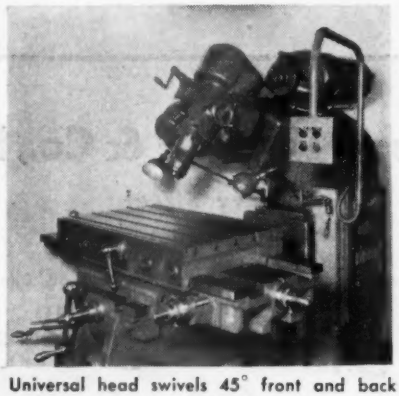
★ BUY UNITED STATES WAR BONDS AND STAMPS ★

New... REED-PRENTICE No. 22-V
UNIVERSAL HEAD VERTICAL MILLER
and DIE SINKER

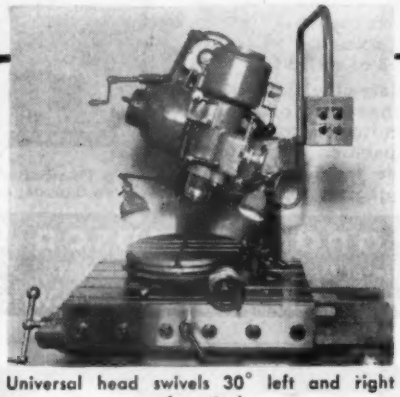
DESIGNED FOR ECONOMIC AND ACCURATE MACHINING OF PLASTIC AND RUBBER MOLDS, DIE CASTING DIES, FORGE DIES, JIGS AND FIXTURES.

FEATURES

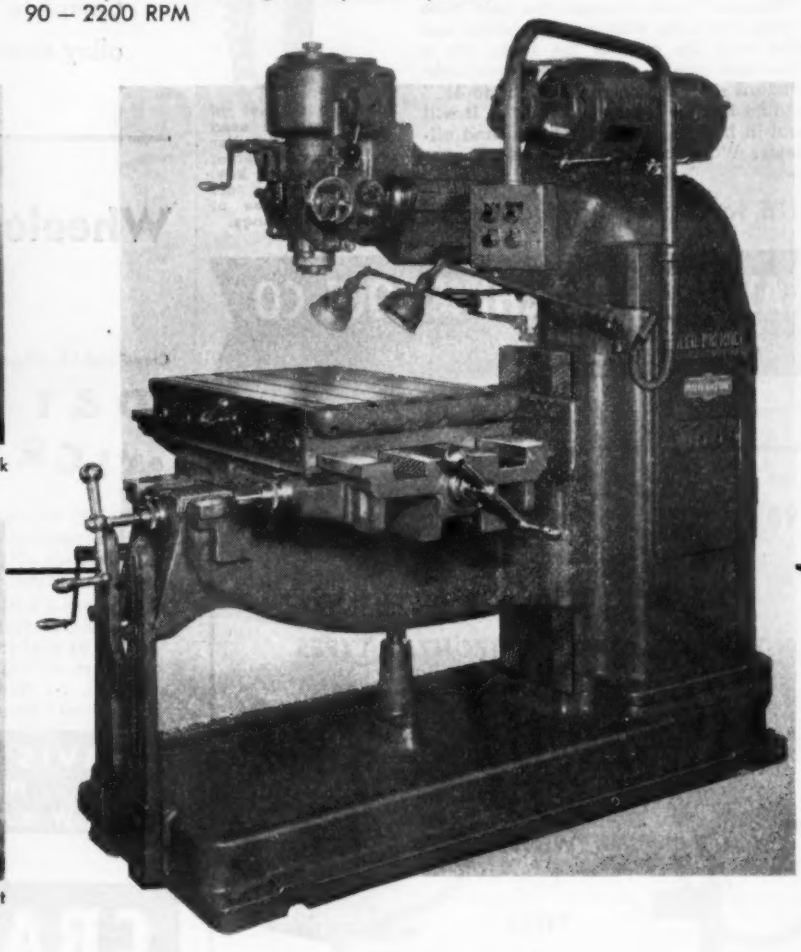
1. Universal head — mounted on sliding ram — mills vertical, horizontal and angular surfaces
2. Extreme rigidity of head and ram permitting use of large dia. cutters
3. Extraordinary range — with large table 32" x 22" and throat depth of 30"
4. With electronically controlled cross and longitudinal power feeds, infinitely variable, ½" — 40" per min.
5. Infinitely variable range of spindle speeds, 90 — 2200 RPM



Universal head swivels 45° front and back of vertical



Universal head swivels 30° left and right of vertical



SPECIFICATIONS:

Longitudinal feed (hand or "electronic" power)	27"
Cross feed (hand or "electronic" power)	20"
Vertical feed of knee (hand)	16"
Horizontal ram adjustment (hand)	16"
Table: length by width by thickness	32 x 22 x 4"
Spindle speeds (infinitely variable)	90 — 2200 RPM
Vertical travel of spindle	5"
Taper hole in spindle NMTBA	#40
Throat depth, with ram fully extended	30"
Electronic power cross or longitudinal feeds	½"—40" per min.
Weight — with power feed	6,750 lbs.
without power feed	6,500 lbs.

ARMY E NAVY

MACHINE TOOLS

REED-PRENTICE CORP.

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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

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CINCINNATI, OHIO

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ALLOY STEELS FOR VICTORY

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

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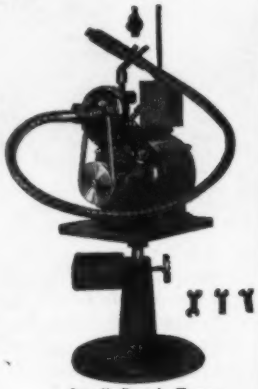
1905 **Strand** 1945
FLEXIBLE SHAFTS

FLEXIBLE SHAFT MACHINES
VERTICAL AND HORIZONTAL TYPES
⅛ to 3 H.P.

Swivel Yoke Types
¼ to 1½ H.P.

ONE HUNDRED TWENTY-FIVE TYPES and SIZES



Small Bench Types
⅛ to ½ H.P.

HIGHEST QUALITY MACHINES
HIGH SPEED STEEL ROTARY FILES . . . ROTARY CUTTERS
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Tubular welded frames with forged ends insure a maximum of accuracy with a minimum of weight.
There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . . *Write for Bulletin 200* or outline your gaging problems.

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0 to 6 in. capacity

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Consistent Quality
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Give the NELCO FIELD ENGINEER a few minutes time and SAVE hundreds of valuable PRODUCTION HOURS!

NELCO CARBIDE TIPPED MILLING CUTTERS

Designed for High Speed Milling

Specially developed and manufactured for machining all types of metals. Massive design, correct grade heavy carbide tips and special high tensile cast iron alloy bodies combine to provide top performance.

The successful use of Nelco Carbide Tipped Milling Cutters lies in their correct application. In order to acquaint you with these efficient, time-saving tools, and how to get desired performance, there is a NELCO FIELD ENGINEER near you, ready to give you first hand details. IT WILL PAY YOU TO LET HIM PAY YOU A VISIT. Write for an "on the job" demonstration of these new Carbide Cutters.

LITERATURE ON REQUEST

NELCO TOOL CO., INC., 370 HAMILTON AVENUE (DEPT. A. M.) BROOKLYN 31, NEW YORK

TO SPEED AND INCREASE PRECISION PRODUCTION—

HELP YOUR THE VITAL

LOCALITE Model 3267-H-102-SV
Directs up to 200 footcandles intense illumination on critical work. Used for small machines, lathes, grinders, drill presses, etc.

LOCALITE Model 3470-P-172-SV
Directs up to 300 footcandles intense illumination on critical work. Used for bench and table operations, assembly, sorting, inspection.

LOCALITE Model 3267-FLB-170
Directs in excess of 100 footcandles fluorescent lighting on critical work. Ideal for certain bench assembly and inspection work.

Increased Production
Enables workers to see faster and comfortably which speeds their task.

Fewer Errors
Quick, accurate seeing avoids costly mistakes.

Reduced Accidents
Good seeing guards against accidents.

Better Work Morale
Comfortable seeing conditions increase morale.

Lower Costs
Faster and better production reduces costs.

Lower Investment
Balanced lighting usually takes less equipment and saves maintenance expense.

ILLUMINATION OF THE RIGHT QUALITY AND RIGHT FOCUS FOR SPECIFIC SEEING TASKS

The first requirement for speed and accuracy on any precision task is easy, comfortable seeing. For machining, assembly and inspection operations, the seeing tools must provide 100 footcandles and more to avoid worker handicap — must be flexible in positioning so the worker can direct illumination exactly where he needs it.

With Localites, the right amount of illumination can be focused directly on each critical work area. Positioning can be changed instantly to meet the seeing need. The various models of Localites solve the problem of providing each different type of precision job with the proper quantity and direction of light for the seeing task. Localites, in the right combination with general illuminating of

FOSTORIA INDUSTRIAL

Specialists in Industrial Lighting for

THE FOSTORIA INDUSTRIAL SERVICE FORMULA FOR LIGHTING ON THE JOB

Careful Study of Critical Work Areas

+

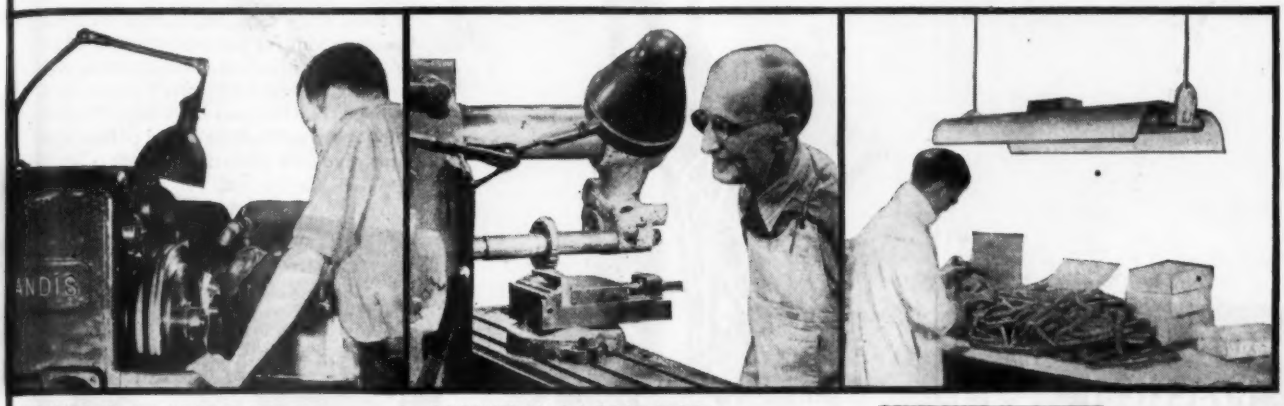
Determination of Lighting Required

+

Recommendation of Lighting Installation

+

EMPLOYEES SEE BETTER
TASKS THEY ARE DOING



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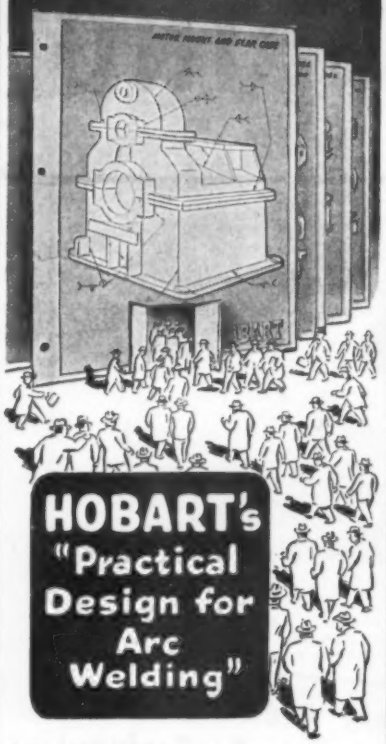

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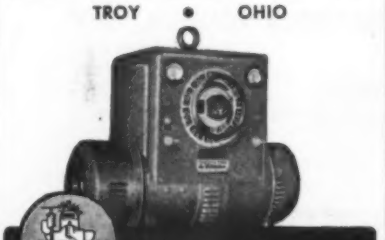

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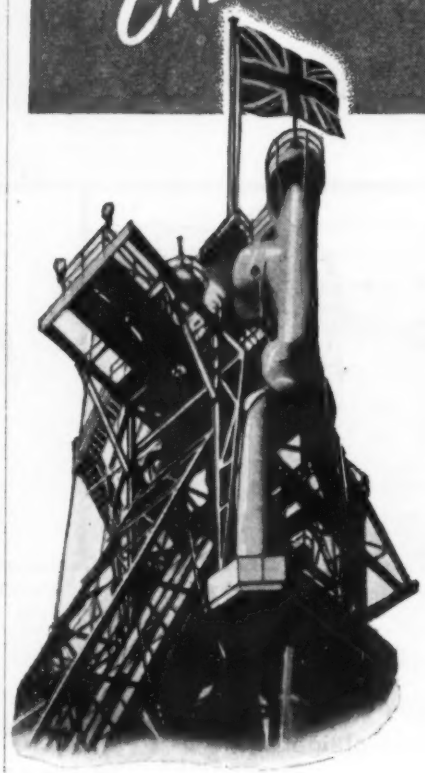

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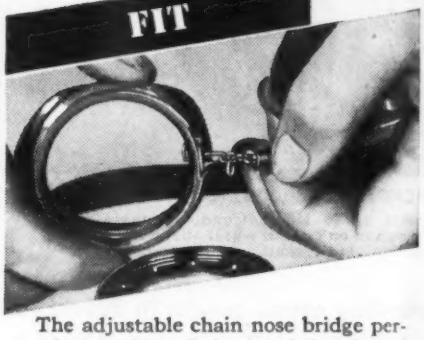

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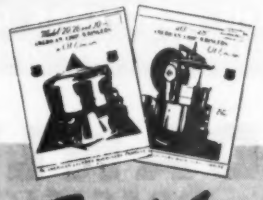
Load of metal chips lowered into AMERICAN Chip Wringer, ready for extraction of oil.



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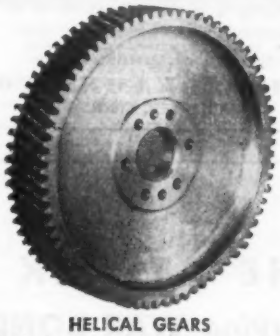

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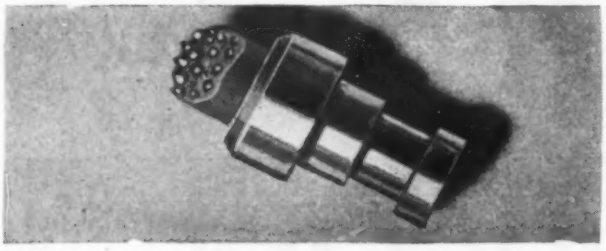

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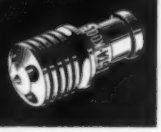

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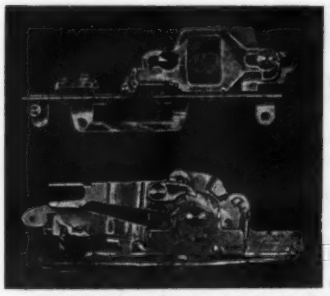

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Engineers experienced in Machine Design and Sheet Metal Products or Household Appliances.

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WANTED ESTIMATOR—An old, well established tool shop in northern Ohio, desires the services of a man capable of estimating gauges, jigs, fixtures, dies and special machinery. Position permanent. Should you have this ability, write giving full background as to experience, education, draft status and former positions held. Compensation open. Write P-322, American Machinist, 330 W. 42nd St., New York 18, N. Y.

YOUNG AND Aggressive man who is experienced in all phases of manufacturing small carbon steel forgings including die making is wanted by established Ohio valley concern to supervise the installation and operation of a forge shop. Give all data re: education, experience, and salary in first letter. This advertisement is known to our organization. Replies will be treated in confidence. Reply P-324, Amer. Mach., 520 N. Michigan Av., Chicago 11.

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SALARIED POSITIONS—This advertising service of 35 years recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

PLANT MANAGER, mechanical enginer, age 41, excellent character, sound judgment, successful record. Experienced in design, development, maintenance, production, labor relations, desires responsible position in small or medium sized company. Principals only. PW-305, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on opposite page)

TO ABLE, AMBITIOUS MEN

in Administration, Manufacturing, Engineering, Designing and Sales, who have good reasons for seeking wider opportunities, we offer **AT NO CHARGE** a dignified means of bringing their qualifications before interested employers.

To Industry we offer confidential Personnel Management Service on a fee or retainer basis.

CURT E. PATTON PERSONNEL ENGINEERS
53 W. Jackson Blvd. Chicago 4

POSITIONS WANTED
(Continued from opposite page)

27 YEAR OLD tooling engineer, extremely high I.Q., three years engineering education. Ten years practical experience in shop and drawing room as tool room machinist, chief tool designer and checker on extensive variety jigs, fixtures, gages cutting, tools, tooling layout, machine tool parts, engines, etc., for many large and small firms. Now desires supervisory position in plant tool room or engineering dept., salary $6000 to $8500 commensurate with duties. Make me an offer. PW-341, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EXECUTIVE in small shop up to 1000 employees, in small town situated in Middle West, South West, or West Coast. Practical shop man thoroughly familiar with modern machine shop mass production methods ranging from blue print stage, thru processing, design, tooling, estimating, plant layout, etc. First clas organizer and producer with the equivalent of a college education arrived at the hard way. Salary secondary to pleasant, harmonious surroundings. Middle aged, family man, 35 years in Detroit and Michigan. PW-342, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

REPRESENTATIVE WANTED

WANTED: TO Represent manufacture of mechanical and clerical products suitable for suburban and rural trade. Efficient sales, installation and maintenance services available, location Central Michigan. Bank reference. RW-292, American Machinist, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVES AVAILABLE

WELL FINANCED St. Louis machinery dealer desires additional lines of machine tools such as lathes, milling machines, shapers, drill presses, brakes, hack saws, home work shop woodworking equipment, and kindred lines. P. O. Box 3317 Progress Station, St. Louis, Missouri.

PHILADELPHIA MANUFACTURERS representative invites correspondence with responsible manufacturers now producing quality line of products and interested in complete sales engineering representation in Philadelphia territory. A capable mechanical engineer with 25 years sales engineering experience in heavy and light industry also aircraft. RA-343, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D.C.

WANTED

ANYTHING within reason that is wanted in the field served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

FINLAND NEEDS GOODS

A Finnish wholesale and agency firm with good business relations seeks contact with American factories and exporters.

Wanted: Machines, tools and other suitable articles.

Answers: Consul Juho Tainio
TAKOWA OY, Finland,
Helsinki, Mikenkatu 8.

MANUFACTURERS' AGENT WANTED BY WELL ESTABLISHED ENGINEERING FIRM CONTACTING LARGE PRODUCTION AND ASSEMBLY PLANTS IN MAJOR INDUSTRIAL AREAS OUTSIDE OF MICHIGAN TO OBTAIN DESIGNING AND PROCESSING OF TOOLS, DIES AND FIXTURES. EXCELLENT POST WAR OPPORTUNITY. STATE LINES NOW CARRIED.

RW-318, AMERICAN MACHINIST
520 North Michigan Avenue Chicago 11, Ill.

WANTED

MACHINE DESIGNERS

Experienced in the designing of heavy metal working machinery, particularly forming and stamping. Splendid post-war opportunities. Anyone now engaged in war work need not apply.

P-308, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

TOOLROOM FOREMAN

New York environment. Located in North Bergen, New Jersey. 20 minutes from Times Square, New York. Toolroom with about twenty die makers. We have excellent equipment. Applicant must have at least ten years of diversified, practical experience in the building of small progressive and precision dies. Should be thoroughly familiar with mass production of small ornamental metal articles. Age preferably 35 to 50 years. Permanent job, liberal pay with future and substantial annual bonus. References required.

P-333, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

PRODUCTION MANAGER

Man experienced in planning, scheduling machine loading and inventory control with experience in small lot production. Machine Shop and sheet metal experience an asset. Excellent post war prospects with an old organization in the middle West.

P-335, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

TOOL ROOM SUPT.
NEWARK

To supervise large tool room. Mechanical engineering background and a minimum of 10 yrs. diversified practical experience in the manufacture of small precision dies and tools essential. Work will include planning and Personnel administration.

Prefer applicant 40 to 50 yrs. who is thoroughly familiar with various phases of mass production manufacture of metal articles. We are a long established company located nearby New York City and have no reconversion problems.

BOX 443, REALSERVICE
110 W. 34th St., New York 1, N. Y.

WANTED

Tool and Methods Engineer

Capable of taking charge of tool design, methods, process planning, and standards. Prefer a man with experience in hot upsetting, threading, machining and finishing of a wide variety of precision upset bolts and forgings, drop forgings, automatic and turret lathe parts. Please give complete data of background, age, and salary requirements. Small, progressive, growing, Eastern manufacturer.

P-336, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

MASTER MECHANIC WANTED

For large, progressive aircraft corporation, Eastern location, with good, post-war future.

Familiar with latest manufacturing methods and equipment in metal working plants, such as engines and stampings. State in first letter education and training, positions held, previous earnings, and earnings expected. Include latest photograph. All correspondence held in strictest confidence and if employed, present position protected. Box P-332.

AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

MACHINISTS
MACHINIST OPERATORS
TOOL MAKERS

Permanent full-time employment with America's leading manufacturer of oilfield equipment. Now building vital war materials but has a definite post war future. Living facilities available.

Cardwell Manufacturing Company, Inc.
Box 2001 Wichita, Kansas

FACTORY SUPT.

Executive qualified to take charge of large production unit with nationally known firm manufacturing small metal articles to close tolerances. Plant located nearby New York City.

Applicant must be thoroughly familiar with all phases of modern production methods. Prefer a man 40 to 50 years with M.E. or equivalent. Write fully.

BOX 433, REALSERVICE
110 W. 34th St., New York 1, N. Y.

Additional Business Opportunity & Wanted Advertising on page 322

WANT TO MANUFACTURE BRITISH-DEVELOPED PRODUCTS?

Manufacturing rights to a wide range of metal products may be obtained *without visiting Great Britain.* British Consulting Engineer, with office in London and extensive connections, will contact and negotiate for you. Works in conjunction with American Consultant. Surveys and reports on any engineering product or subject prepared.

BO-330, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

SEND FOR OUR SPECIAL PRICES OF PRECISION TAPPER GROUND TAPS

High speed tapper taps, bent and straight shank. Sizes ranging 3/56 to 10/32 in 90° bent shank. Sizes ranging ¼-28 to ½-20 NF in 90° & 180° bent shank. Sizes ranging ¼-28 to ¾-16 in Acme and straight shank 15" overall. ALL GOOD STANDARD BRANDS FOR IMMEDIATE DELIVERY.

DE WITT TOOL COMPANY
173 GRAND STREET, NEW YORK 13, N. Y.
SEND US YOUR INQUIRIES

MANUFACTURE IN ENGLAND

Well established engineering concern located in Lancashire, England is willing to undertake the manufacture of complete engineering products previously exported to Great Britain.

This company, a member of Fedration of British Industries, has large machine shops and iron foundry, and modern engineering plant employing 350 to 400 personnel. Abundant labor supply available.

Right Concern may obtain a part or controlling interest in the business. Fullest investigation is offered to bona fide inquirers.

BO-331, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

PLANER

in good operating condition, only recently removed from production line in machine tool plant.

Table length	20'-10"
Table width	40"
Center of table to R.H. housing	24½"
Center of table to L.H. housing	37½"
Top of table to cross rail	40"

complete with 20 hp., 220v., 3 ph., 60 c. V-belt motor, jack shaft, pulleys and belts.

Reasonable offer accepted for quick removal

Cleereman Machine Tool Co.
GREEN BAY WISCONSIN

FOR SALE

RODGERS BORING MILL—36" vertical—one turret head on rail—one side head—new in July, 1942.

BINSSE BORING BAR—3" horizontal—24"x36" table.

OHIO MILLING MACHINE—No. 34 Plain—10"x58" table—19" Vertical feed—11" cross feed.

WHITCOMB PLANER — 30"x30"x8' — closed—one head on rail.

GRAY PLANER—36"x36"x16'—closed—two heads on rail.

NEKOOSA HYDRAULIC PRESS—100 ton—portable—hand operated—24' bars.

FORT HOWARD PAPER CO.
GREEN BAY WISCONSIN

POST WAR PRODUCTS *Wanted*

By manufacturer with extensive engineering, toolmaking and manufacturing facilities. We are equipped to design, redesign, engineer and produce any metal item, write

WHALEY ENGINEERING CORP.
P. O. BOX 1336 NORFOLK, VA.

#25 Foote-Burt Drill Press, #5 taper.

8" Arter Rotary Surface Grinder.

#4 Cincinnati Vertical Miller.

#0-8 Cincinnati Vertical Millers. Motorized. Year 1941.

18" Cincinnati Plain Mig. Miller. Motorized. Year 1941.

Lincoln Type Millers—Pratt & Whitney, Hendey and Putnam.

4" Stevens Vertical Slotters. Year 1941.

#2 American Plain Milling Machine, motorized. Year 1943.

THE ELYRIA BELTING & MACHINERY CO.
Elyria Ohio

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

MONA

B. D. BROOKS, INC.
301 Atlantic Ave., Boston, Mass.

Flexible joint of modern design for underground Conveyor Belts required for the British Coalfields. Would entertain agency or manufacturing rights. Write

BO-314, AMERICAN MACHINIST
Aldwych House, Aldwych, London, W.C.2

96"x60"x12' LIBERTY Openside Planer—2 heads on rail one side—extra housing—outer table support—table 48"x12' D.C. reversing motor drive synchronous motor—Generator Set—Class 2—11 yrs. old—Cost $35,000—our price $16,500—ceiling $24,000.

2—105" Betts Vertical Boring Mills. Two Swivel Heads. Arranged for Motor Drive, table 96"x8½". 57" Clearance under rail. Can show running—For quick sale $1750 each.

H. J. KOONTZ, MASSILLON, OHIO, Ph. 8180

WANTED

New or used Rotary Double Pointed Tack Machine, as manufactured by A. H. Nilson Machine Company or equal.

M. D. GIARDINO
101 PARK AVENUE, NEW YORK 17, N. Y.
LExington 2-9288

FOR SALE
600 TON HYDRAULIC PRESS

Watson Stillman rebuilt 48" single daylight opening, downward double acting ram 10" dia. by 21" stroke, platen 24"x24" with clear space left to right 30¼" between 5½" dia. strain rods. We will purchase your Surplus Equipment.

UNIVERSAL HYDRAULIC MACHINERY CO.
285 Hudson Street New York, N. Y.

NEW—USED **MACHINERY** and EQUIPMENT

LARGE STOCK ON HAND

Hasco MACHINERY COMPANY
661-671 FRELINGHUYSEN AVE.
NEWARK 3, N. J. BIGELOW 3-3484-28

WANTED

WATERBURY FARREL FOUNDRY EYELET MACHINE. 6-8 or 10 PLUNGER.

Wire Collect to

VIRJUNE MACHINE COMPANY
23 Jefferson Street Waterbury 40, Conn.

FORGING MACHINERY

One 7" and one 8" UPSETTING AND FORGING MACHINES—LATEST TYPE
One 20,000# STEAM DROP HAMMER
One set large size FORGING ROLLS

FS-334, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

UNIVERSAL TOOLS!

NATIONALLY ADVERTISED BRANDS AND PRICES
If It's A Tool—We Have It, Can Get It, or It Isn't made! PRICE LIST & ORDER BLANK FREE!!
UNIVERSAL TOOL COMPANY
O. B. Domattois, President
1527 Grand A.M. Kansas City, Missouri.
Immediate Shipments: Overnight by Air:
To Anywhere—U.S.A.

FOR SALE

1942 ONAN—Portable Generator—Model V-45 4½ K. W.—6.3—KVA—V-4 Cylinder Gas Driven—110 Volt 60 Cycle—220 Volt Single Phase—Serial No. 82-42601—Weather-proof Cover—Phone for information Baldwin 1217M or ME: 3-1546.

V. LANGDON
38 SOUTHARD ST. BALDWIN, L. I.

PIPE New & Reconditioned

ALL SIZES for ALL PURPOSES
Cut and Threaded to Your Specifications
VALVES AND FITTINGS
UNITED PIPE & SUPPLY CO. Department 105 NORRISTOWN, PA.

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

MORE VALUE FOR YOUR MONEY

• • • OUR INVESTMENT IS YOUR SECURITY
• • • SOUND RECONDITIONING

EXCEPTIONAL ITEMS FROM OUR MODERN STOCK

SHEARS & METAL CUTTING MACHINERY

Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Niagara #98 Production Power Brake & Folder. 72"x14 ga. cap. Equal to new.
Bliss #232 Slitting Shear, 14 ga.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 16 ga. x 42" Gap Foot Shear.
Niagara #216-B Slitting & Circle Shear.
Niagara #9S Power Seamer.
4" x 42" Geared Slip Roll Former.
3" x 36" Geared Slip Roll Former.
Niagara 48" Roller Leveller.
Niagara #30 Beader & Flanger.
Niagara #0 Beader.

POWER PRESS HEADQUARTERS

#4 Bliss D.C. B.G. Forging 3" stroke.
Toledo #34 Back Flywheel, arranged M.D.
Bliss-"Stiles", No. 1, Plain flywheel.
Waterbury-Farrel 105-ton O.B.I., M.D., hi-spd, power Press, double roll feed. 1" stroke, Bed 37" R to L, 20" F to B.
#203E Toledo Gap Dbl. Cr.
Bliss #2A Adjustable bed Horn Press, 2½" stroke, back flywheel.
Erdle #4, Stiles type, 1½" stroke.
Baxendale #20, OBI, 2" stroke.
#35 Niagara back flywheel, geared.
Wells #22 back flywheel. Open back.
200 ton A.C.F. Hydraulic Press. Bed 24"x 36", 4-post.
Beck Duplex Embossing Press.

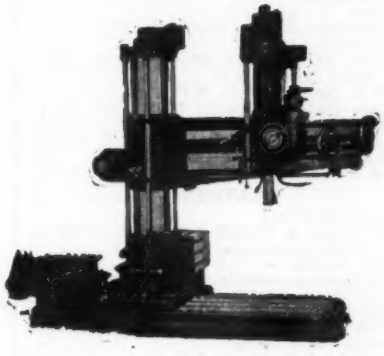
Waterbury-Farrel Cold Header, double stroke, open die, ½" cap.
Manville Cold Header, single stroke, solid die, 3/16" cap.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
48" Gisholt, vert. Boring & Turning Mill.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
#31 Lucas Horizontal Boring Mill, 3" bar.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

GRINDERS

12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
14"x36" Cincinnati Cyl., motor driven.
6"x32" Norton Cyl., overhead c/s drive.
Brown & Sharpe #2 Surface Grinder, with chuck & rectifier.

MILLING MACHINES

#3, #4, #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Millers.
No. 1½ Valley City Universal, Cone Dr.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 Morse Taper. Table 20"x67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13", 4 spindle (2). 2 spindle (1).

RADIAL DRILLS

3' Dreses, 10" rd. col. QCG., M.D.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford.
3' 9" col. American, S.P.D.

MULTIPLE DRILL

Fox #15H 54 spindle hydraulic feed.

LATHES

16 x 8 Hendey Arranged M.D.
14 x 6 Pratt & Whitney semi—Q.C.G.
Putnam, 26 x 12 Heavy Q.C.G., arr. for M.D.
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
20 x 10 Lodge & Shipley, G.H., M.D., Taper.
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
Lodge & Shipley 16" x 8' 12-Speed G.H.
Hendey 14" x 6' Toolroom Lathe, taper, M.D.

AUTOMATIC

1—1¼" Cone 4-spindle Automatic.

SHAPERS AND GEAR CUTTERS

26" Cincinnati Triple Geared, Belt Dr.
12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
14" Rockford crank shaper.
No. 2 Baker Keyseater.

MISCELLANEOUS

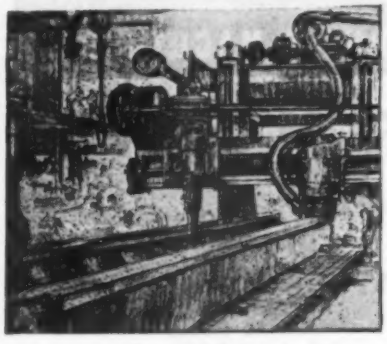
J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.
Standard Automatic Drop Hammer, 300#.

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY
Machinery Merchants

18 WARD ST.
ROCHESTER 5
N. Y.

ENGINEERED REBUILDING



By Simmons

Every machine listed in this column is in our warehouse at press time.

2¼" Bar LUCAS Horizontal Table Type Boring Mill, M.D.
2½" Bar CLEVELAND Horizontal Table Type Boring Mill, M.D.
5" Bar DETRICK-HARVEY Floor Type Horizontal Boring Mill, M.D.
24" BULLARD New Era Vertical Turret Lathe
42" BULLARD, NEW ERA, 1100 serial
42" N-B-P Car Wheel Borer, M.D.
66" N-B-P Vertical Tire Mill
10' CINCINNATI Vertical Boring Mill
4' HAMMOND Sensitive Radial Drill
4' AMERICAN 15" Column, Plain
6' CARLTON Motor-on-Arm, Plain
8' N-B-P Motor-on-Arm, Plain
#16 BLANCHARD Surface Grinder
33"x9" G & E Spur Gear Cutter
27" BRIDGEFORD Axle Turning Lathe
29" PUTNAM Axle Turning Lathe
42" PUTNAM Car Wheel Lathe
#4 CINCINNATI High Power, Plain
#4 CINCINNATI High Power, Vertical
#5 B & S Plain Miller, M.D.
#6 BECKER Vertical Miller, M. D.
#10 N-B-P Heavy Vertical Miller
24"x24"x12' INGERSOLL Planer Miller
24"x36"x12' INGERSOLL Side Miller
30"x30"x10' NEWTON Slab Miller
42"x26"x12' INGERSOLL Planer Miller, Four heads, M.D.
48"x48"x24' N-B-P Planer, 3-heads, M.D.
48"x48"x32' GRAY Planer, Four Heads, 230 volt DC Reversing Motor Drive
72"x72"18' N-B-P Heavy Planer, Four Heads, 230 Volt DC Motor Drive
RT-40 SCHULTZ-NAUMANN Beam Shear
5" Capacity U.E.F. Alligator Shear
72" 105 Tons L & A Multiple Punch
6"x6"x⅝" Double Angle Shear
12" SELLERS Crank Slotter
20" SELLERS Crank Slotter
2" LANDIS Pipe Threader
30' H & J Plate Planer, M.D.

SIMMONS ENGINEERED REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 North Broadway, Albany, N. Y.
N. Y. Office: 50 East 42nd St.

CLOSEOUTS

BORING MILLS
HORIZONTAL

2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL

66", 120" Niles
42" Bullard, M.D., 54" Colburn, M.D., 2 hds.

TURRET LATHES

24" Gisholt, 6½" hole
Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"
Acme 3¼" M.D.

GRINDERS

P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D.
Norton 50"x28", M.D.
Gardner 72' disc, M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, M.D.
B. & S. No. 2 Surface, M.D.
Norton 10x36" Hydraulic, M.D.
Badger 24" Dbl. Opposed, M.D.
B. & S. No. 10, 11 Cyl.
No. 2 Cincinnati, Centerless, M.D.
B. & S. No. 1, 3 Universal

LATHES

McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
14"x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x22' Putnam S.C.G., D.C.M.D.
32"x35' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, 6, 6F Hand Screw
B. & S. No. 00, 0, 2, OG
5 Spdle Davenport 9/16" cap.
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
P. & J. 6A, M.D.
⅞" Cone 4 spindle
Gridley ⅞" 4 spindle

GEAR CUTTERS

No. 2, 12 Barber-Colman Gear Hobber
B. & S. No. 3-26", 4-36"
Gleason 11" Bevel
G. & E. 60" gear cutter

SHAPERS

15", 24" P. & J.
16", 20", 26" Stockbridge
20" G. & E., M.D.

RADIALS

3' 4', 5', 6', 7', 8' American Triple Purpose
3', 3½', 4', 5' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES

10" P. & W. Auto.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B. & S. Universal
K. & T., B. & S. No. 2, 3 Dbl. overarm
B. & S. No. 2, 3, Vert.
Milwaukee No. 2½B Vert.
Kempsmith No. 1 Univ.

MISCELLANEOUS

#10½G Niagara Power Squaring Shear
Gorton No. 1S Engraving Machine
6 spindle Avey Drill, 15" overhang
McCabe ½" Flanger
Rochester No. 5B Hammer
Baker #2 Keyseater 5 P.D.
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
#7 Burr Keyseater
4x4x⅝" Williams & White Angle Bending Roll
10' Erie Shear ¼" cap.
Natco No. 13 Multiple Spindle Drill
48" Southwest gate shear ½" capacity 24" gap.
8'x¼" cap. Kling Bending Rolls
6' Hilles & Jones Roll

AARON MACHINERY CO.
45 Crosby St.
New York 12, N. Y.

QUALITY TOOLS

AUTOMATICS

½", No. 0G Brown & Sharpe
⅞" and 2" Cleveland Model B
1¾" Gridley Model G 4 spindle
1⅝" New Britain 6 spindle
4½" Gridley 4-spindle Model H
No. 454 New Britain, 4-spindle chucking
14"x19" Fay automatic lathe
15" Sundstrand automatic lathe
Gisholt Simplimatic

BROACHES

No. 1 Foote Burt hydraulic surface
Twin 10 Oilgear hydraulic
No. 2B Oilgear hydraulic
No. V2 American vert. hydraulic
No. 3 Lapointe double screw
No. 2 Standard screw press

DRILLS

Sensitive, all makes and types
21" Canedy Otto (New)
20", 21" & 24" Cincinnati upright
20" Barnes box Column mfg.
22" Barnes 2-spindle, all grd., self oiling
4' Western radial, Timken bearing, M.D.

GEAR CUTTERS

No. 12 Barber Colman hobbers
No. 12 Bar. Col. long bed splining
Nos. 7 and 21 Fellows shapers
No. 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x20" G & E spur gear cutter
26"x6" G & E spur gear cutter
11" Gleason straight bevel, segments & Gears
15" Gleason spiral bevel pinion and gear roughers
18" Gleason bevel testers and lappers
8" Red Ring spur gear lapper
Cimatool "Peerless" gear chamferers
Lipe 2-spindle gear chamferer

GRINDERS

No. 2 Cincinnati centerless
No. 72A3 Heald Sizematic
No. 1 G Granby internal
No. 75 Heald internal
Heald No. 72 automatic electric sizing internal
12"x36", 16"x36" & 16"x32" Landis
6"x20", No. 10 & 6"x32" No. 11 B.&S.
Nos. 1 & 2 Brown & Sharpe universal
10"x18", 10"x36" & 10"x50" Norton
18", No. 6 Besly opposed disc
20" Gardner semi-automatic disc grinder
Ingersoll face milling cutter grinder, type EN8S
Cincinnati face milling cutter grinder
Gisholt tool grinder
16"x32" Landis crankpin
No. 10 Blanchard surface
No. 1½ Cincinnati tool & cutter

FORGING EQUIPMENT

No. 2B Nazel air hammer, motor driven
No. 1 Evans Ajax taper forging roll
3" Acme upsetter (forging machine)

LATHES

12"x8' Sebastian
14"x6' Mulliner
15"x6' Sebastian
18"x6' Reed Prentice
18"x8' Boye & Emmes
24"x12' Boye & Emmes
28", No. 3B Foster turret
22" & 26" Libby turret
28" Gisholt turret
8" and 12" Sundstrand Stub
15" Sundstrand automatic stub

MILLERS & BORING MILLS

2½" Universal horizontal mill
3¼" Blomquist Eck horizontal mill
4½" Universal horizontal mill
5" Barret cylinder borer
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
No. 2 Cincinnati plain
No. 4—36 Cincinnati Hydromatic
No. 3 Sundstrand bed type mfg. miller
48" Oesterlein tilted offset miller
42" Ingersoll continuous rotary
Type C Hall planetary thread miller
48" Newton C66A cont. rotary
No. 4 Lees Bradner univ. thread
4" Rice Barton double spline

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No. 1-8 Kent-Owens Hydraulic, m.d., latest type
No. 34-36 Cincinnati Plain Hydromatic, m.d., latest type
No. 34-36 Cincinnati Duplex Hydromatic, m.d., with tracer control on each head, latest type
No. 4-36 Cinn. Plain Hydromatic, m.d., latest
Hall Planetary Thread, m.d.
4½x12" Pratt & Whitney Thread, belt
18" Cincinnati Plain Automatic, m.d.
28" Cincinnati Plain Automatic, s.p.d.
6x14" Pratt & Whitney Thread, belt
6x20" Pratt & Whitney Type B Thread, m.d.
6x48" Pratt & Whitney Thread, m.d.
6x80" Pratt & Whitney Thread, m.d.
24"x6' Ingersoll Slab, m.d.
30"x21"x20' Ingersoll Slab, m.d.
36"x36"x14' Bement Slab, m.d.
54"x54"x10' Liberty Planer Type, m.d.
Burr Mfg., m.d.
No. 12 Pratt & Whitney Lincoln Type, belt
Carter & Hakes Mfg, belt

HAND MILLING MACHINES

No. 3 Garvin Hand, m.d.

PLANERS

24"x24"x 5' Gray, belt, 1 head
24"x24"x 6' Sellers, belt, 1 head
24"x24"x 6' Pound, belt, 1 head
30"x30"x10' American, belt, 1 head
30"x30"x10' American, belt, 2 heads
30"x30"x14' Gray, belt, 2 heads
36"x36"x10' Niles, belt, 2 heads
36"x36"x12' Woodward & Powell, m.d., 3 hds.
36"x36"x12' Powell, 2 heads, m.d.
36"x36"x16' Gray, m.d., 2 heads
36"x36"x18' Niles-Bement-Pond, var. speed m.d., 2 heads, box table
36"x36"x20' Gray, belt, 2 heads
36"x36"x20' Cincinnati, belt, 2 heads
36" widened to 44"x36"x20' Gray, rever. m.d., 2 heads
42"x42"x26' Gray, m.d., 2 heads
48"x48"x30' Cincinnati, m.d., 4 heads
48"x48"x40' Sellers, var. speed m.d., 2 heads
50"x48"x32' Niles - Bement - Pond, reversing m.d., 4 heads, box table
60"x60"x20' Cincinnati, m.d., p.r.t., 4 heads
60"x60"x20' Gray, m.d., 4 heads, box table
60"x60"x40' Niles - Bement - Pond, reversing m.d., 4 heads, p.r.t.
72"x72"x24' Niles - Bement - Pond, reversing m.d., 4 heads, box table
96"x72"x18' Pond, belted m.d., 4 heads

ENGINE LATHES

10"x20" Pratt & Whitney m.d., Bench Lathe, latest type
10"x3½' South Bend Underneath Motor Driven Tool Room Bench Lathe, latest
14"x6' Pratt & Whitney, cone
14"x8' Sidney, cone, motorized
16"x8' Lodge & Shipley, cone
20"x8' American Geared Head, m.d., taper
20"x8'6" centers Springfield Geared Hd., m.d.
20"x10' bed American Geared Head, m.d., taper
22"x16' centers (22' bed) American 100 H.P. Input Super Lathe, m.d.
24"x12' American H.P. Geared Head, m.d., taper
24"x30' Schumacher-Boye, cone
25"x16' LeBlond Geared Head, m.d.
26"x12' Schumacher-Boye, cone
27"x16' LeBlond Type C Geared Head, m.d.
27"x16' LeBlond, cone, taper
27"x18' LeBlond Geared Head, m.d.
30"x13'6" N.B.P. Geared Head, m.d.
30"x18' American Geared Head, m.d.
30"x26' Lodge & Shipley Selec. Hd., m.d.
30"x28' Niles "Time Saver", m.d., p.r.t., latest type
36"x105 Putnam, motorized
36"x12' Wright, cone
36"x13½' centers American Geared Hd., m.d.
36"x14' bed Boye & Emmes, cone, motorized
36"x24' American Geared Head, m.d., taper, 2 carriages
36"x28'6" Niles H.D., m.d., p.r.t., latest type
36"x28'6" Niles, H.D., m.d., p.r.t., taper, latest type
36"x36'6" Niles H.D., m.d., p.r.t., 2 carriages
36"x38' American Geared Head, m.d.
42"x26' American Geared Head, m.d., p.r.t.

PLAIN MILLING MACHINES

No. 08 Cincinnati Plain Auto., model EA, m.d., latest
No. 000 Brown & Sharpe Plain, m.d., latest
No. 2B Brown & Sharpe Plain, m.d. in base
No. 3B Brown & Sharpe Plain, m.d. in base
No. 3B Milwaukee Pl. Dble. Overarm, m.d.
No. 4 Cincinnati H.P., m.d.
No. 5B Heavy Brown & Sharpe Plain, m.d.

VERTICAL MILLING MACHINES

No. 2 Brown & Sharpe, m.d.
No. 3 Cincinnati, m.d.
No. 3B Milwaukee, m.d.
No. 3B Milwaukee, m.d. in base
No. 3V Toledo, s.p.d.
No. 4 Cincinnati, m.d.
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d
No. 6 Becker, cone
2 spindle Newton, m.d.

INTERNAL GRINDERS

No. 6 & No. 10 Bryant, belt
No. 16—22" Bryant Hydraulic Hole Grinder, m.d., latest type
No. 20 Bryant, belt
No. 24—20" Bryant Hydraulic, m.d., very late type
No. 72A3 Heald Sizematic, two motor drive

SURFACE GRINDERS

No. 1 Fraser Lapper, 26" plate
Builders Iron Fdry. Co. Surface Grinder, m.d.
14" Pratt & Whitney Vertical, m.d.
38"x38"x12' Gray Planer Type Surface, md.
54" Bridgeport Knife, belt
No. 76D Baldwin-Tuthill Knife Grinder, cap. 76" knives

DISC GRINDERS

No. 20 Gardner Comb. Disc Grinder and Roll Sander, m.d.
No. 4 Gardner, m.d.

TOOL & CUTTER GRINDERS

No. 1 Cincinnati Universal, belt
Gisholt Universal Tool, belt
Gleason Cutter Grinder, belt
Gould & Eberhardt Gear Cutter, belt

HAMMERS

3000 lb. Chambersburg Steam Drop
400 lb. Bliss Board Drop, belt
800 lb. Bement Single Frame Steam
1100 lb. Bement Miles Single Frame Steam

KEYSEATERS

No. 2 Morton, belt
30" stroke Morton, m.d.

MANUFACTURING LATHES

3½x36" Lo Swing, s.p.d.
3x80" Lo Swing, s.p.d.
8x84" Lo Swing, md.
11"x4' Wells Speed Lathe
13x24" Coulter Automatic Threading, m.d.
13"x96" Automatic Threading, m.d.
15"x6' Automatic Threading, belt
17x124" centers LeBlond Rapid Production Geared Head, m.d.
20"x16' American Geared Head, arr. for spindle boring
N.B.P. Quartering Machine, m.d.
No. 5—42x96" Niles-Bement-Pond Center Driving Car Wheel Lathe, m.d., new
No. 5 Niles-Bement-Pond Center Drive Car Wheel Lathe, used

PRESSES

No. 4½ Bliss S.S. D.C.
S51 Ferracute D.C
B33 and B45 Metalwood Hydro-Pneumatic

PUNCHES & SHEARS

No. 6 Long & Allstatter S.E.
Cleveland Type G, cap. 2" thru 1"
Cleveland Type C, cap. 1" thru ½"

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No. 3 and 8 Nutter & Barnes Cold Saws
No. 5 and 6 Cochran-Bly Cold Saws
No. 138 Espen-Lucas Cold Saw
No. 15 Lea-Simplex Cold Saw

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No. 2B Foster Universal, chucking, m.d.
No. 2 Pratt & Whitney Shaver, m.d.
2¼x24" Jones & Lamson Steel Hd., m.d., bar
No. 3A Warner & Swasey Universal, m.d., chucking
No. 3A Warner & Swasey, m.d., bar
3x36" Jones & Lamson Geared Hd., m.d., bar
3x36" Jones & Lamson Geared Head, md., chucking
3¼" Cincinnati Acme Flat Turret, m.d., chucking
2 spindle 3x36" Jones & Lamson, m.d., chucking
3½x32" Jones & Lamson Steel Hd., m.d., bar
10" Libby Type A, m.d., chucking
24" Gisholt Turret, cone
26" Libby Type C, m.d., chucking
28" Gisholt Turret, cone

ROLLS

No. 3 Ajax Forging Rolls, m.d.
No. 4 Hilles & Jones Straightening Rolls, m.d., cap. 1¼ plate 6' long or 1" plate 8' long

CIRCLE SHEARS

No. 30A Quickwork Rotary, m.d.
No. 2 Bethlehem Rotary, ¼" cap. 32" throat
No. 3 Gray Sheet Metal Cutter, ⅜" cap. 36" throat
Southwark Rotary Cutter, ⅜" cap.

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8' Robinson Leaf Brake, cap. 10 ga.
McCabe Pneumatic Flanger, cap. ½" plate
N.B.P. Hand Power Flanger, 8'x¼"
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Magee Sheet Metal Wiring & Edging Machine, m.d.

SLOTTERS

10" Newton, cone
12" Niles, m.d.
12" Bement-Miles, m.d.
15" Canada, m.d.
48" Niles-Bement-Pond Geared, reversing m.d.

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6 spindle ½" Acme Semi-Automatic Nut Tapper, m.d.
No. 5 Webster & Perks 5 spindle Vertical Nut Tapper
½" Rickert & Shaffer Vertical
No. 1 Garvin Knee Type

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General Electric 200 amp. Arc, direct connected to Pontiac Engine
Toledo Butt Welder, type No. 9, 220 volts, 40 KW, cap. 1¼" round stock

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No. 1 Stewart Blast Furnace
Detrick & Harvey 2 spindle Profiler
No. 12M Morey 2 spindle Profiler, m.d., latest
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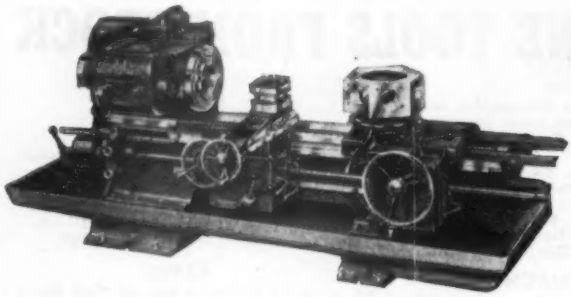

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1—W & S #a Univ. Heavy Duty Turret Lathe, Timken Bearings, taper attmt., machine in excel. condition, latest type, stand. tooling, power feed to comp. cross slide, cross sliding hex turret and other tooling.

5—Cin.-Acme No. 1 semi-univ. Turret Lathes, Timken Bearings, M.D., sw. 20¾" over hed., over carriage 14", hole thru spin. 3⅝", 12 spin. speeds, max. turning lgth. 29" M.D., arrgd. for chucking.

1—W & S No. 3A Univ. Turret Lathe, 4½" capac., pl. bearings Ser. No. 211628, sw. 21½", over carriage 17¼", 12 spin. speeds, max. lgth. turned 44", power rap. trav., M.D. arrgd. for chucking.

1—4" x 34" J & L steel grd. hed. Turret Lathe, M.D., chuck. equip., Ser. No. 35064.

1—2½" x 34" J & L grd. fric. hed. Turret Lathe, M.D. chuck equip.

1—3¼" x 34" J & L grd. fric. hed. Turret Lathe, M.D.

★ 1—B & S No. 0 Motor Driven Hand Screw Machine, serial No. 787, capac.: hole thru feed tube—diam. 13/32", hole thru spin.—diam. ¾" feeds any lgth. to 3", turns any lgth. to 2¼", dist. chuck to turret 7", motor in base, wire feed, asst. of tools. ★

BORING MILLS

Gisholt 72" Vert. Bor. Mill, sw. 72", tbl. diam. 68", max., hght. under cross rail 44", vert. trav. swivel heds. 27", max. hght. under swiv. heds. 18½", feeds of heds 10, power rap. trav., arrngd. for M.D.

1—Bullard 36" Vert. Turret Lathe, rap. prod., capac. 36½" diam. x 24" in hght. under cross rail, vert. move. side hed. 20", horz. 20", M.D.

1—Gisholt 36" Vert. Bor. Mill, sw. 41", tbl. 32" diam., hght. under rail 10", 3 hole swiv. turret, vert. trav. turret 13½", M.D.

1—Univ. 3½" Knee Type Boring Mill, 3½" bar. No. 6 Morse Taper, size of tbl. 30" x 48", cross feed to tbl. 36", long 56", vert. 30", no. spin. speeds 16, max. dist. face plate to outer support 84".

RADIAL DRILLS

1—Amer. 4' Trip. Pur. 32 speed, M.D., box tbl., diam. colm. 4'11", No. 5 Morse taper.

1—Cin.-Bick. 6'15" col.

1—Cin.-Bick. 6'17" col.

LATHES

American 24" x 12' QCG, grd. hd. heavy pattern high duty Engine Lathe, sw. over bed. 26½", sw. over compound rest slide, 17½", lgth. of bed. 12', dist. btw. cens. 84", hole thru spin. 2-16".

2—Hendey 14" x 6' Yoke head, QCG Eng. Lathes, with taper attmt., M.D., collets, dist. btw. cens. 36".

1—Bradford Machine Tool Co. 14" x 6' QCG Eng. Lathe, 4 step cone single bk. grd., M.D. dist. btw. cens. 34".

THREAD MILLERS

1—Hanson-Whitney 8" x 16" Univ. Thread Miller, 220-3 phase 60 cycle, elec. equip., right hand ext. lead cams, 1942 vint., used very little. Inquire for complete details.

Pratt & Whitney 4½" x 12", 6" x 40", 6" x 132" Thread Millers.

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3—Blanchard No. 16 hi powered Vert. Surf. Grinders, 26" and 30" chucks.

1—P & W 22" Vert. Surf. Grind., M.D., BB, spin. with mag. chucks, tbl. wkg. sur. 18" x 48", tbl. overall 34" x 8", max. tbl. trav. 48", vert. adj. spin. 14", will take grind. wheel 22" diam. x 1¾" face, with oil pump and tank, arrgd. for M.D.

1—Norton 15" x 15" x 96" Openside Surf. Grinder, mag. chucks, M.D.

1—Besly dbl. spin. No. 218, BB, Opposed Grinder, AC elec. equip., wet grind. attmt., wheels in attmts., 1944 very latest type, used but a matter of hours. Write for full details.

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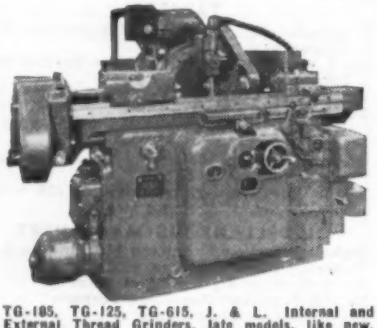

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18"x30" Lodge & Shipley 24-speed Lathe

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GEAR SHAPERS, #7 High Speed, M.D. & #6
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72 Hyd. 2 M.D.
GRINDERS, Bryant #3, 6 & 18 Internal, M.D.
GRINDERS, Rivett #103 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Landis Hydraulic, 6x18" M.D.
GRINDERS, Pratt & Whitney, 14" Vertical Surface, M.D., 9x31" Magnetic Chuck
LATHES, American 14x6' & 20"x8', M.D.
LATHES, Hendey 24"x10' T.A. M.D.
LATHES, Lodge & S, 20"x10' Q.C. M.D.
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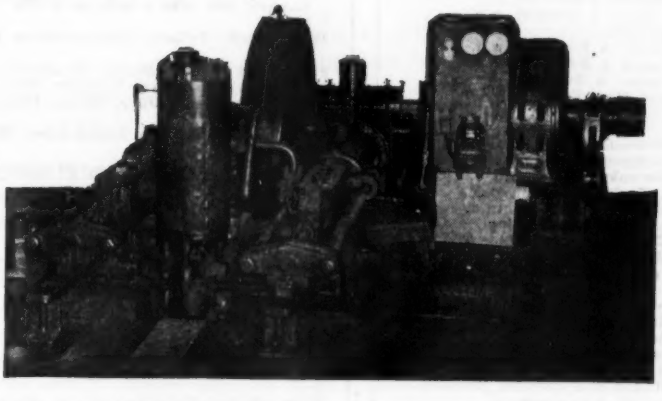

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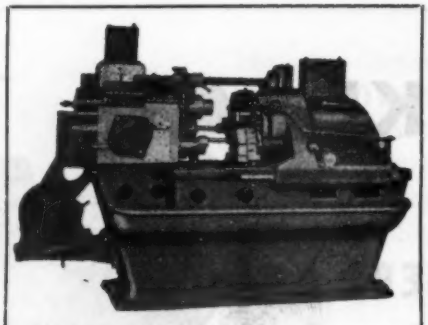

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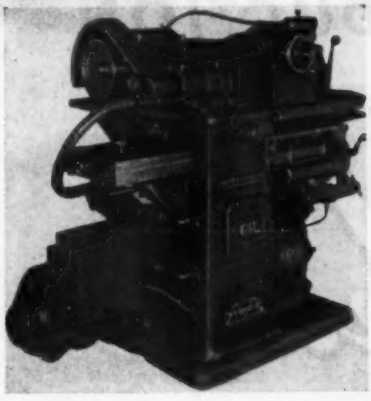

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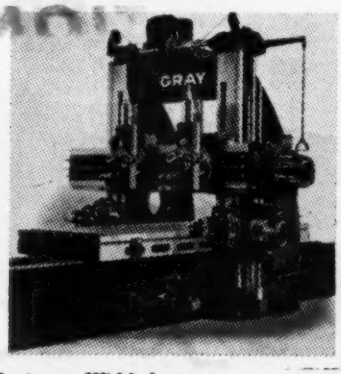

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